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RCRA Ground-Water Monitoring Compliance Order Guidance

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CHAPTER 1

INTRODUCTION

1.1 Purpose and Objectives

The purpose of this document is to guide enforcement officials in developing administrative orders to address RCRA ground-water monitoring violations at interim status land disposal facilities.[1] The document's primary objective is to promote the development of orders that correct interim status violations in a manner that is consistent with the needs of the RCRA permitting process. Enforcement personnel are encouraged to involve permit writers in the formulation of technical remedies to ensure that enforcement remedies are consistent with the long-term monitoring responsibilities of the facility.

The guidance is intended to apply to the RCRA-authorized States as well as to EPA regional offices. While State and Federal enforcement authorities may differ (e.g., states may have different order authorities or different maximum penalties), the States and EPA are enforcing essentially the same set of regulations. Therefore, remedies designed by State enforcement officials should be similar to those outlined in this document.

The document will not be concerned with policy matters such as how to decide which cases to pursue or how to decide between administrative and

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[1] This document covers only the requirements for ground-water monitoring that apply to hazardous waste management units that were in existence on November 19, 1980. It does not address monitoring requirements that may be imposed on solid waste management units as a result of the "continuing releases" provision, §3004(u) of RCRA, as amended by the Solid and Hazardous Waste Act Amendments of 1984.

judicial response. Instead, the document focuses on the formulation of technical remedies and on the appropriate technical content of orders. Specifically, it concentrates on how to fashion ground-water remedies for facilities operating during the transition period between interim status and permitting.

1.2 Significance of the Interim Status to Permitting Transition Period

The Agency and the regulated community are now entering a period unique in the life of the RCRA program -- the period after which all Part B permit applications are due, but before all facilities have been permitted. EPA and the States have already received many Part B applications. By November 8, 1985 the Part B permit applications of all the nation's land disposal facilities will be due.[2] It is likely, however, that it may take several years for EPA to process and finalize permits for all these facilities. As a result, many facilities will face a fairly long period of time between the due date of their application and the issuance or denial of a permit.

The existence of this transition period is significant because it is the only time in the life of the RCRA program that land disposal facilities will be bound by the interim status ground-water regulations (Part 265) and the permit application regulations (Part 270). It is the first time, therefore,

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2 The Solid and Hazardous Waste Act Amendments of 1984 require all land disposal facilities to submit a Part B permit application within twelve months after the enactment of the Amendments or lose interim status. See §3005(e) of the Resource Conservation and Recovery Act (RCRA).

that enforcement officials can draw upon the authorities of both Part 265 and 270 when fashioning technical remedies at interim status facilities.

As described in Chapter 3, the Part 270 regulations impose additional monitoring and information generating requirements on the owner/operators of interim status facilities. The Agency designed the interim status (Part 265), permit application (Part 270), and permitting regulations (Part 264) to be followed in sequence. A facility moves from one phase of monitoring to the next (and from interim to permitted status) by building upon the information generated during the previous stage. The monitoring and cleanup obligations of an owner/operator also expand as the facility approaches permitting and/or the evidence of ground-water contamination increases.

Unfortunately, certain facilities have not adequately implemented even the first phase of the monitoring sequence, the installation of a competent detection monitoring network. Consequently, these owner/operators cannot provide the sampling data or plume characterization required for a Part B permit application.

Enforcement officials can help solve this problem by crafting technical remedies that integrate the requirements of Parts 265 and 270. Facilities that have failed to progress through the monitoring sequence as planned, should be required to condense the sequence so as to prepare the facility for permitting as rapidly as possible. Much of this document concentrates on exploring how enforcement officials can use the requirements of Parts

265 and 270, and other available authorities to design remedies that will ease the transition between interim and permitted status.

1.2.1 Plume Characterization Under §270.14(c)(4)

In terms of ground-water monitoring, the most significant requirement of the Part 270 regulations is the provision outlined in §270.14(c)(4). This provision requires applicants to describe any plume of contamination that has entered ground water and define its extent, and provides EPA with the authority to compel sampling for the broad list of constituents listed in Appendix VIII of Part 261 (hereafter referred to as "Appendix VIII").

This provision applies to all facilities that have detected plumes under interim status monitoring and to facilities that have not detected plumes if the facility's interim status system is not capable of detecting a plume should it occur.[3] Facilities with inadequate 265 monitoring systems should not be allowed to avoid Appendix VIII sampling and assessment activities simply because they have avoided compliance with RCRA ground-water monitoring requirements in the past. Moreover, such facilities should not be allowed to delay undertaking the more comprehensive assessment and sampling activities mandated by §270.14(c)(4), by first going back and

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[3] This interpretation has been consistently advanced in all previous guidance documents that address this issue. (See: the RCRA Permit Writer's Guidance Manual For Ground-water Protection, October 1983, p. 204; and the November 29, 1984 policy memorandum from Lee Thomas and Courtney Price, entitled, "Part B Applications with Incomplete Ground-water Monitoring Data.") Moreover, this expectation has been made known to facility owners through the Permit Applicant's Guidance Manual, May 1984 (See pps. 9-42 and 9-43).

implementing the less demanding monitoring protocol established in Part 265. Requiring these facilities to sample for Appendix VIII constituents is consistent with the language of §270.14(c)(4) and the general purposes of the Part 265 requirements.

One of the purposes of the Part 265 regulations was to prepare facilities for permitting. EPA assumed that data from detection and assessment monitoring under Part 265 would identify facilities that had contaminated ground water. These data would serve as the foundation for developing the ground-water information required to be submitted in Part B of the permit application [§270.14(c)]. Where an owner/operator has not complied with Part 265 monitoring requirements, however, EPA cannot determine whether the facility has contaminated ground water and hence cannot easily determine which ground-water monitoring program should be written into the facility's permit.

At this point in the program, allowing an applicant to comply with the literal requirements of Part 265, however, would cause unacceptable delays. An applicant that needed to "start-over" by installing or relocating monitoring wells could require as much as two and one-half years to complete the entire Part 265/Part 270 monitoring sequence (see timeline in Figure 5.2). Consequently, where EPA finds that an applicant has not instituted an adequate monitoring program under Part 265, the Agency will require owner/operators to condense the Part 265/Part 270 monitoring sequence in order to generate the ground-water data necessary for permitting (closure or post-closure) as quickly as possible. This condensed monitoring program is described in more detail in Chapter 5.

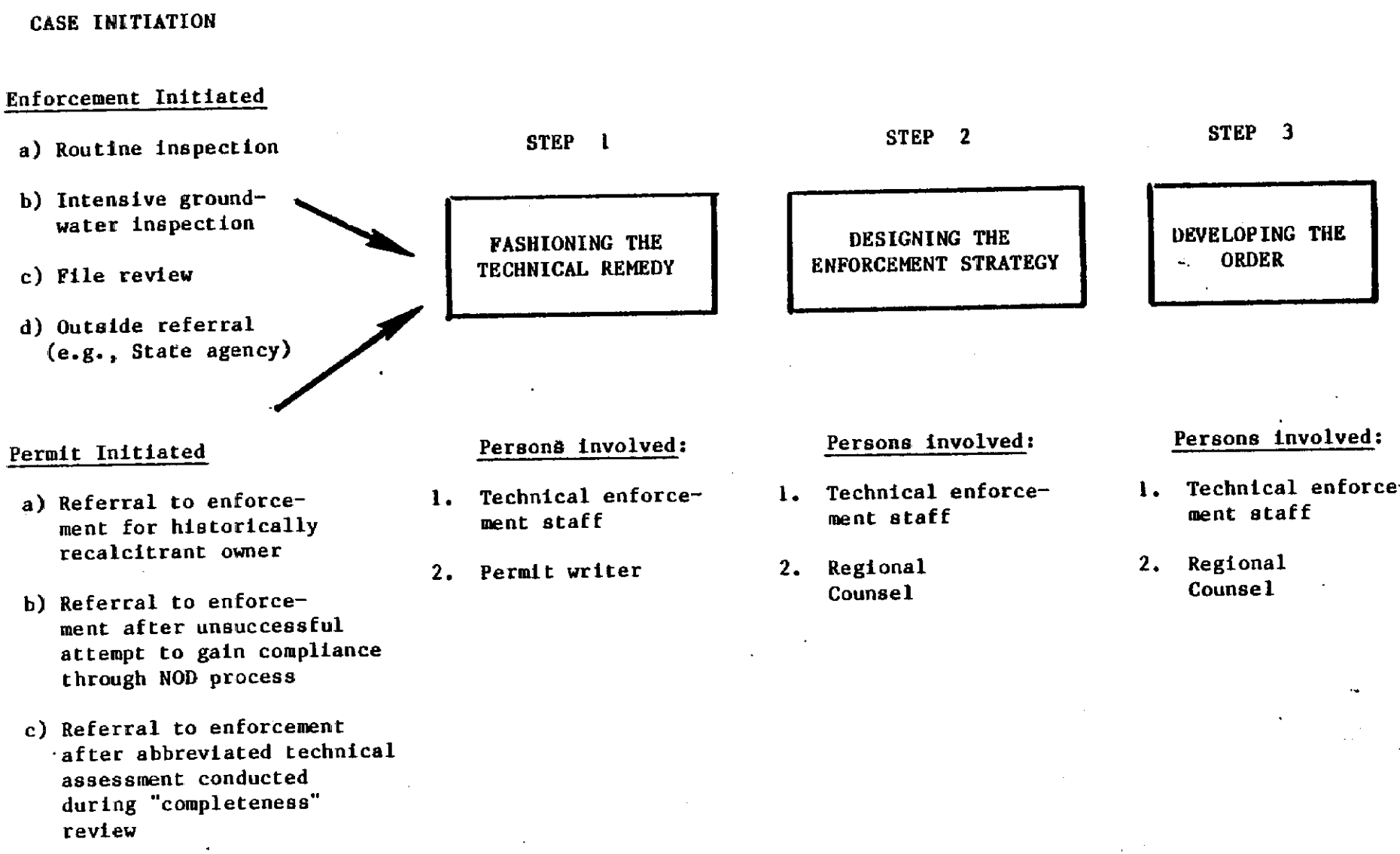
1.3 Overview of the Administrative Enforcement Process

The unique character of the transition period from interim status to permitting demands both increased coordination between permit writers and enforcement staff and a new conceptual approach to the enforcement process. The cornerstone of this new approach is the fashioning of technical groundwater remedies that satisfy the Agency's long term regulatory objectives.

To implement this approach, the Agency recommends a three-step enforcement process (see Figure 1.1). STEP 1 is to outline the technical remedy sought. In most cases, this step will require considerable planning and close coordination between the enforcement staff and the permitting staff. Enforcement officials and permit writers must work together to construct remedies that generate the information necessary for permitting while correcting deficiencies in the facility's interim status monitoring system.

STEP 2 is to develop an enforcement strategy to secure the desired remedy. Central to this effort is the selection of the order authority best suited to compel the remedy. If regulatory provisions have been violated, the enforcement staff should determine whether the desired remedy can be secured through a §3008(a) order citing these violations. (See Chapter 4 for a description of the order authorities and a discussion of their use.) If there is a question whether the entire remedy can be compelled using a §3008(a) order, enforcement staff should consider using a different enforcement authority (e.g., §3008(h), §3013, §7003 or CERCLA §106 orders), or a combination of authorities if necessary.

Figure 1.1 MODEL OF THE ENFORCEMENT PROCESS



STEP 3 of the administrative enforcement process is the development of the order. The order is the mechanism by which the Agency ensures that the desired remedy is actually executed by the facility. The goal of this step is to formalize exactly what actions the respondent must take in order to come into compliance. The more explicitly the Agency can express its expectations, the less opportunity there is for misunderstanding, wasted effort, and delay. As Chapter 6 explains, it is important to develop this specificity as early in the enforcement process as possible, although unless default is expected, it may not be necessary to express it in the compliance order accompanying the complaint. Chapter 6 provides guidance on how to write orders that are easily enforced and effective at achieving the remedy developed in STEP 1.

1.3.1 Case Initiation

Targeting cases for this enforcement process is the responsibility of both the enforcement staff and the permits staff.

In the enforcement program, cases generally evolve from the discovery of an inadequate interim status monitoring program. Inadequate systems may be identified as a result of routine facility inspections, more detailed ground-water inspections, or enforcement file reviews. Once a problem-facility is identified, enforcement staff should immediately contact the permits staff to determine the facility's status vis a vis the permitting program.

Early coordination with the permits staff is important for two reasons. First, the permits staff may have information on the site that could aid

in the development of an enforcement action against the facility. Where complete, for example, a Part B application can provide valuable information regarding a facility's wastes, the hydrogeology of a site, etc. Even where deficient, a Part B application can prove useful to enforcement officials by highlighting gaps in the facility owner's understanding of his/her site.

Second, coordination is necessary to avoid duplication of effort and to ensure that actions taken by the enforcement division are "consistent with" and "supportive of" the permitting process. Consistency is important so that the Agency presents a unified front to the facility. For example, before issuing a complaint the enforcement staff should know whether there is an outstanding Notice of Deficiency (NOD) compelling the same activities. "Supportive of permitting" implies consideration of the permit writer's informational needs when designing remedies. The permit writer must become involved in the enforcement process early on so that (s)he can ensure that his/her own permit-writing needs and the facility's future Part 264 monitoring needs are accurately represented and accounted for during the development of the remedy.

Cases may also enter the enforcement process via the permits staff. In fact, permit writers (by virtue of their Part B reviews) are often in the best position to identify problem cases. Permit writers are encouraged to refer cases to enforcement and use enforcement staff to facilitate the permit process.

Enforcement involvement may be appropriate, for example, when a facility has submitted a highly deficient Part B and past dealings with the company have

demonstrated that the owner/operator is unlikely to correct deficiencies in a prompt and forthright manner. In such cases, the permit writer should consider referring the case to enforcement immediately after issuing a general NOD that requires the submittal of the missing information within a very short period of time. Historically recalcitrant applicants should not be given long periods of time under the informal NOD process to generate data/information that they should have developed by the due date of their permit; rather they should be compelled to develop this information on an enforceable compliance schedule pursuant to an order. Likewise, if a permit writer has failed to make progress using the NOD mechanism, (s)he should work with the enforcement division to use formal mechanisms to compel compliance rather than continue to issue NODs.

Permit writers should also expand their initial "completeness" review of incoming Part Bs to include an abbreviated technical assessment of the ground-water monitoring portion of the application. While the permitting staff clearly does not have the resources to consider all Part B applications in full as they arrive, there are benefits in focusing briefly on the parts of each application that are particularly troublesome for the regulated community, are environmentally sensitive, or will require a long time for the facility to revise if the application is inadequate. Some aspects of an application are so central to the adequacy of the permit in general that it may be wise to perform an abbreviated assessment up front, rather than wait until the entire permit can be reviewed to discover and correct major deficiencies (e.g., the facility must install an entirely new well system before it can generate the data necessary for permitting).

The consequences of not identifying such deficiencies up front could be significant delays in the permitting process or a weakening of future enforcement cases because so much time has elapsed between the submittal of the application and the issuance of a complaint. If permit writers did conduct abbreviated reviews on the ground-water portion of incoming applications, they could refer cases with major deficiencies to the enforcement staff. Enforcement officials could then use the combined authorities of Parts 265 and 270 (or other authorities as necessary) to advance the facility to the point where the ground-water monitoring portion of the permit could be easily written when the facility's full application comes up for review.

1.3.2 Facility Management Planning

The enforcement process as described above demands a high level of coordination between the enforcement and permitting staffs. For any particular facility, the Agency and States must decide whether ground-water problems should be addressed through enforcement or through the permitting process. Facility Management Planning (FMP) is the mechanism that Regions and States should use to orchestrate this division of labor.

As described in the Revised FY85 and FY86 RCRA Implementation Plans (RIP), the draft National Permit Strategy (April 8, 1985), and the draft FMP guidance (July 12, 1985), Facility Management Planning is an Agency tool for coordinating effort and resources between the Regions/States and enforcement/permitting. Regions must develop a Facility Management Plan for all "environmentally significant" facilities according to a schedule laid out in the RIP. Each plan must identify: 1) what action(s) should

be taken at (or by) a facility; 2) what tool (e.g., order, NOD, post-closure permit) should be used to compel the action; and 3) who (State or Region, enforcement or permitting) has lead responsibility for ensuring that the action is completed.

Decisions regarding the above points evolve from a "facility analysis" conducted by representatives from Regional and State permitting and enforcement offices. During the facility analysis, the various representatives review the information available on a facility (e.g., Part B, inspection reports, etc.) and begin formulating a strategy for handling that facility in the short and long term. All strategies devised for individual facilities must be in accord with the RIP and other Agency policies.

Where actual or potential ground-water contamination exists, the strategy will generally include data or information gathering to support the long-term goal of either issuing the facility an operating permit or closing the facility and implementing corrective action for releases into ground water.

It is during the facility management planning process that enforcement officials and permit writers can initiate the type of coordination necessary to implement a range of options including this guidance. The review group, for example, may decide that eventually a facility should be issued a permit, but in the interim the Agency should use an order to compel the facility to investigate possible ground-water contamination and develop the appropriate permit application data and plans. At this point, the lead enforcement official should solicit the assistance of the permit

writer in formulating the technical remedy necessary to advance the facility toward permitting.

1.4 Relationship to "Late and Incomplete Part B Policy"

On September 9, 1983, Lee Thomas and Courtney Price issued a memorandum entitled, "Guidance on Developing Compliance Orders Under Section 3008 of the Resource Conservation and Recovery Act; Failure to Submit and Submittal of Incomplete Part B Permit Applications." This memo, commonly referred to as the "Late and Incomplete Part B Policy," affirmed the Agency's authority to take enforcement action for late and incomplete permit applications. It set out the procedures for addressing Part B violators and established a flat penalty amount that should be assessed in each case.

The Late and Incomplete Part B policy has been largely superseded by more recent policies and is further modified by this document. First, the "Enforcement Response Policy" (December 21, 1984) established that submittal of a late, incomplete or inadequate Part B is a Class I violation (see page 18). In addressing Class I violations the Enforcement Response Policy states that EPA and the States may issue warning letters prior to §3008(a) complaints if they wish but are not required to do so. Therefore, the directive in the Late and Incomplete Part B Policy that warning letters should always precede §3008(a) complaints is superseded.

Second, the Late and Incomplete Part B Policy established a flat penalty amount of $5,000.00. That requirement has since been superseded by the "RCRA Civil Penalty Policy" (May 8, 1984), which establishes a matrix that should be used to determine administrative penalty amounts. The matrix

is based on two factors, the degree of a handler's deviation from regulatory requirements and the potential for harm presented by the violation. Thus, penalty amounts should be determined individually for each Part B violator; the flat $5000.00 amount should not be applied automatically.

Finally, the Late and Incomplete Part B Policy envisioned issuing complaints that require, simply, the submittal of missing information. The Agency has since realized, however, that incomplete Part B's seldom represent mere oversights on the part of the applicant. More often, Part B's are incomplete or inadequate because the applicant failed to generate the required information and/or failed to comply with interim status requirements.

When issuing a complaint against a Part B violater, the Region or State should not merely require the respondent to "submit the information required in Section 'XYZ' of the regulations." Rather enforcement officials should determine the underlying reasons for the poor Part B and detail in the proposed order what needs to be done to ensure a proper submittal. Often the reasons behind an inadequate Part B are extremely complex, especially when the deficiencies involve ground-water monitoring. Enforcement officials can help ensure the adequacy of the next submittal by outlining in the order the nature and scope of the work to be performed. Further, Regions and States should generally assess penalties for all Part 270 violations and any contributing Part 265 violations.

1.5 Structure of this Document

This document is divided into six chapters. Chapter 2 presents an in depth discussion of the Part 265 and Part 264 ground-water monitoring regula-

tions. Chapter 3 builds upon this framework and explores the interrelationship between the two sets of regulations. These two chapters are designed to give enforcement officials the regulatory perspective they will need to design ground-water remedies that are consistent with and supportive of the permitting process.

Chapter 4 provides an overview of the enforcement tools available to secure desired remedies. It compares and contrasts the various order authorities and discusses some of the factors enforcement officials should consider when designing enforcement strategies.

Chapter 5 discusses how to fashion a technical remedy. The chapter uses a case-study approach to illustrate how enforcement officials can construct remedies that correct present violations while advancing a facility toward permitting. The chapter develops a model remedy for a typical "transition-period" facility and then describes how to use the combined authorities of Parts 265 and 270 to secure that remedy.

Finally, Chapter 6 discusses how to write an order to secure the desired remedy. The chapter emphasizes the importance of specificity in order writing and explores various strategies that may be followed in developing and issuing administrative orders. Appendix A includes a model order that illustrate some of the principles developed in this chapter.

The Agency has also prepared a draft document entitled, RCRA Ground-Water Monitoring Technical Enforcement Guidance (TEGD). This document addresses specific technical elements of ground-water monitoring system design. For example, it discusses the types of well construction methods

that the Agency considers acceptable for yielding representative water samples. The draft final version of the TEGD is dated August, 1985 and is available from the Office of Waste Programs Enforcement (OWPE).

CHAPTER 2

REGULATORY OVERVIEW

This chapter provides an overview of the Part 265 and Part 264 ground-water monitoring regulations. It attempts to abstract from the regulatory language and describe how the programs were intended to function in the real world. Enforcement and permitting officials are strongly encouraged to read this chapter even if they are familiar with the regulations.

The chapter discusses only the requirements that apply to hazardous waste management units. In accordance with the Solid and Hazardous Waste Amendments of 1984, permitted facilities may soon be required to monitor solid waste management units as well as hazardous waste management units. However, the specific requirements applicable to these units have not yet been established and will not necessarily be identical to the current Subpart F program detailed below.

2.1 Interim Status Ground-Water Monitoring - Part 265, Subpart F

The goal of the Part 265 regulations is to ensure that owners and operators of interim status landfills, land treatment facilities, and surface impoundments evaluate the impact of their facility on the uppermost aquifer underlying their site. To achieve this goal, the regulations establish a two-stage ground-water program designed to detect and characterize the migration of any wastes that escape from a facility.

The focus of both stages of the program is on evaluating the nature and extent of leakage, not on the removal or treatment of contamination should it

be detected. Removal and treatment of contamination deemed unacceptable must be dealt with through the exercise of the Agency's enforcement authorities under §3008(h) or §7003 of RCRA, §106 of CERCLA, or through the RCRA permitting process (See Chapter 4 on Order Authorities and Section 2.2.3 of this chapter).

2.1.1 Detection Monitoring

Detection monitoring, the first stage of interim status monitoring, is required at interim status land disposal facilities unless the owner/operator can demonstrate that there is a low potential for migration of hazardous waste from his/her facility to water supply wells or to surface water. The objective of detection monitoring is to determine whether a land disposal facility has leaked hazardous waste into an underlying aquifer in quantities sufficient to cause a significant change in ground-water quality.

To accomplish this objective, the regulations direct the owner/operator to install a monitoring network which includes wells located downgradient from the facility at the limit of the waste management area and wells located upgradient that are capable of providing samples representative of ground water unaffected by the facility. Although the regulations recognize that for a small site with the simplest hydrogeologic subsurface three downgradient wells and one upgradient well might suffice, the number, depth, and location of wells must ultimately be selected so that the network meets the regulatory performance standard of immediately detecting any

migration of statistically significant amounts of hazardous waste or hazardous waste constituents into the uppermost aquifer [§265.91(a)].

To determine whether leakage has occurred, the owner/operator must compare monitoring data collected downgradient from his/her facility to background water quality data established over an initial period of one year. The comparison is based on three sets of parameters designed to characterize water unaffected by the facility and to predict possible leakage of hazardous waste.

The first set of twenty parameters, listed in Part 265 Appendix III, defines the general suitability of the aquifer as a drinking water supply. These parameters were selected because they are recognized by the Safe Drinking Water Act as important to overall drinking water suitability.

The second set of parameters (chloride, iron, manganese, phenols, sodium, and sulfate) establish general ground-water quality and can be used to characterize the suitability of ground water for a variety of non-drinking uses. Information on these parameters is largely collected in anticipation of future confirmation of leakage. Should detailed assessment of ground water prove necessary, historical data on these major ion groups will help owner/operators predict the mobility of hazardous waste under actual site conditions.

The final set of parameters includes four measures selected as gross indicators of whether contamination of ground water has occurred. These four indicators - pH, specific conductance, total organic carbon (TOC), and

total organic halogen (TOX) - were chosen because of their widespread use, their well-established test procedures, and their general ability to reflect changes in the organic and inorganic composition of ground water. Faced with designing a monitoring program that would be responsive to a large undefined set of chemical compounds at unspecified concentrations, the Agency chose to rely on broad, surrogate measures that could predict whether significant contamination had occurred.

The regulations require the owner/operator to sample and analyze for all three sets of parameters quarterly for one year. Quarterly sampling is required so that seasonal effects will be incorporated into the characterization of background water quality. At the end of the first year, the owner/operator must establish background for each contamination indicator by averaging the quarterly measurements obtained for that parameter from the upgradient wells. These upgradient mean values are important because they establish the initial background concentrations to which all subsequent upgradient and downgradient concentrations will be compared.

After initial background is established, the owner/operator continues sampling on a less frequent schedule. The ground-water quality parameters (chloride, phenol, etc.) must be analyzed at least annually and the contamination indicators (TOX, pH, etc.), at least semi-annually.

At this point, however, detection monitoring begins to focus more specifically on the four contamination indicators. Each time a facility samples for a contamination indicator, the owner/operator must compare the values obtained from his/her upgradient and downgradient wells with the

mean values obtained for that parameter during the first year of background sampling. (Note that both upgradient data and downgradient data are compared to first year mean data derived from upgradient wells). The regulations specify that the facility owner should use a Student's t-test to the .01 level of significance when making comparisons [265.93(b)].

If a Student's t-test for an upgradient well shows a significant increase in the concentration or value of an indicator parameter (or any change in pH), it may mean that sources other than the facility are affecting ground water. Alternately, a change in upgradient water quality could be due to mounding of contaminated ground water beneath the facility or a change in hydraulic gradient such that originally upgradient wells are now downgradient relative to the facility. (This condition would be reflected in changes in ground-water elevation measurements over time.) Whatever the cause, a significant change in upgradient water quality should be investigated and noted in the company's annual report to the Agency [§265.94(a)(2)(ii)].

A Student's t-test for a downgradient well that shows an increase in an indicator parameter (or any change in pH), signals potential ground-water contamination and is the first indication that a facility may be leaking. If a statistically significant change is detected, the facility moves into the second phase of interim status monitoring, ground-water assessment.

2.1.2 Assessment Monitoring

Once a significant change in water quality triggers a facility into assessment, the owner/operator must notify the Agency and submit a proposed

program for determining whether hazardous wastes or their constituents have entered ground water and if so, their concentration, rate, and extent of migration [§265.93(d)(2)]. Because detection monitoring parameters are non-specific, a statistically significant change in one parameter may not necessarily represent migration of hazardous waste constituents into ground water. For example, pH could change independent of contamination if recharge patterns at the site shifted such that ground water infiltrated through formations with significant buffering capacity. The first step in assessment monitoring, therefore, is to determine whether hazardous waste constituents have indeed migrated into ground water.

In many cases, the detection monitoring network already installed at the site can be used for this purpose. Of course, use of the existing system assumes that the network is capable of detecting low part per billion levels of hazardous waste constituents (listed Appendix VII of Part 261 and in §§261.24 and 261.33) in the uppermost aquifer. If sampling reveals no contamination, the owner/operator may return to his original detection protocol or enter into a consent agreement with EPA to follow a revised protocol designed to avoid future false triggers. If, on the other hand, contamination is confirmed, the owner/operator must begin characterizing the rate and extent of migration.

Normally, assessment monitoring will require installation of additional well clusters located to define the vertical and horizontal extent of the plume. Unlike detection monitoring where wells would be placed more or less evenly along the downgradient border of the waste management

area, wells in assessment monitoring could be concentrated in one area of the site so as to track the migration of a localized discharge. In addition to direct sampling for hazardous waste constituents, the owner/operator may rely on indirect techniques, such as electrical resistivity or ground-penetrating radar, to help define the boundaries of a plume.

Based on these techniques, the owner/operator must submit to EPA (as soon as technically feasible), a written report assessing the quality of ground water at the facility (§265.93(d)(5)). After this initial assessment of ground-water contamination, the facility must continue assessment monitoring at least quarterly until the facility closes or is permitted. Additionally, the owner/operator must continue detection monitoring in any wells unaffected by the initial leak (i.e., wells away from the edge of the plume where no hazardous waste constituents have been detected or wells around other non-leaking units).

It is important to note that no direct regulatory consequences flow from a finding of contamination in assessment monitoring. The purpose of assessment monitoring is strictly to acquire information to support future decisions regarding the need for corrective action. The purpose does not include determinations of whether or not such facilities are environmentally acceptable. Strategies for cleaning up unacceptable contamination must be developed through the permitting process or through enforcement action under §3008(h), §7003, or under CERCLA §106.

2.2 Permit Regulations for Ground-water Monitoring - Part 264, Subpart F

The primary goal of Part 264 ground-water monitoring is to ensure that owners and operators of facilities handling hazardous waste detect any release of contamination into ground water and take corrective action when such contamination threatens human health or the environment. To achieve this goal, the regulations establish a three-stage program designed to detect, evaluate, and correct ground-water contamination arising from leaks or discharges from hazardous waste management facilities. The program is graduated so that the monitoring and clean-up responsibilities of the owner/operator expand as the impact of the facility on ground water becomes better understood.

2.2.1 Detection Monitoring

The first stage of the program, detection monitoring, is implemented at facilities where no hazardous constituents are known to have migrated from the facility to ground water. Applicants who are seeking permits for new facilities or for interim status facilities that have not triggered into assessment, would generally qualify for Part 264 detection monitoring (the latter assumes, of course, that the interim status monitoring network is adequate to detect contamination).

The actual monitoring requirements of Part 264 detection are similar to those already imposed under the interim status regulations. In the preamble to the regulations EPA expressed the expectation that properly designed interim status networks would be sufficient for most permit detection

systems. In Part 264 detection monitoring, however, the permittee routinely monitors for a select set of indicator parameters specified in the permit rather than for the four indicator parameters specified in the Part 265 regulations. Should the arrival of leachate from the facility be indicated by an increase (or pH decrease) of any of the parameters relative to background, the permittee must immediately sample for all constituents listed in Appendix VIII in order to determine the chemical composition of the leachate.[4] In addition, the owner/operator must submit, within 180 days, an engineering feasibility plan that outlines an approach for cleaning up ground water should clean up prove necessary [§264.98(h)(5)]. The facility in turn is obliged to move into the next phase of the Part 264 ground-water program - compliance monitoring.

2.2.2 Compliance Monitoring

The goal of compliance monitoring is to ensure that leakage of hazardous constituents (Part 261 Appendix VIII constituents) into ground water does not exceed acceptable levels. Through the permit, therefore, the Agency and the facility must specify what level of each constituent will be considered environmentally acceptable and then establish a program of routine monitoring to ensure that acceptable levels are not exceeded. If concentration limits

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[4] The Agency may use enforcement discretion so as not to require sampling for those substances that are unstable in ground water or for which there exists no EPA-approved test method. For a list of these substances see the August 16, 1984 memo from Courtney Price and Lee Thomas entitled, "Enforcing Ground-Water Monitoring Requirements in RCRA Part B Permit Applications." The Agency has also proposed to waive monitoring requirements for such substances (See 49 FR 38786, October 1, 1984).

are exceeded, the permittee must institute a corrective action program designed to bring the concentration levels back within acceptable limits.

The permit writer establishes the framework for a compliance monitoring program by incorporating a ground-water protection standard into the permit. The standard consists of four elements, each of which must be specified in the permit.

The first element of the standard is a listing of all Appendix VIII hazardous constituents present in ground water that could reasonably have been derived from the facility. The burden of demonstrating that a particular Appendix VIII constituent could not reasonably be derived from a facility, lies with the owner/operator. Claims of exclusion must be based on a detailed chemical analysis of the facility's waste and must consider possible chemical reactions that could occur in the facility or during the migration of leachate into ground water. An exclusion is also available for an individual constituent if the owner/operator can demonstrate that it is incapable of posing a substantial present or potential hazard to human health or the environment. Given this standard of proof, however, exclusions will be granted rarely; the ground-water protection standard of most facilities, therefore, will include all Appendix VIII constituents detected in ground water.

The basis for identifying the Appendix VIII constituents present in ground water will vary depending on the status of the facility at the time of establishing the protection standard. Facilities that are operating under detection monitoring permits will have identified the Appendix VIII consti-

tuents present in ground water as part of their detection monitoring responsibilities [see §264.98(h)(2)]. Facilities that have not yet received permits and are operating under Part 265 assessment monitoring, however, may have to perform additional sampling because assessment monitoring requires the determination of Appendix VII substances rather than the full complement of constituents listed in Appendix VIII. (Appendix VII is but a subset of Appendix VIII - see section 3.3 for further explanation of this point). Consequently, the facility owner in Part 265 assessment monitoring will have to undertake additional sampling and analysis before the facility can be permitted. [Note: the permit application regulations (Part 270) require facilities to characterize plumes with respect to Appendix VIII constituents (see §270.14(c)(4))].

The second element of the ground-water protection standard is the specification of a concentration limit for each hazardous constituent listed in the facility permit. Where possible, concentration limits must be based on well established numerical concentration limits for specific constituents. Where established standards are not available, the permit writer must set concentration limits so as to prevent degradation of water quality unless the owner/operator can demonstrate that a higher limit will not adversely affect public health or the environment. Following this approach, concentration limits must be set at either:

1) the maximum concentration limit for drinking water established by the National Interim Primary Drinking Water Regulations (where applicable);

2) the background level of the constituent in ground water; or

3) an alternate concentration limit (ACL) if the owner/operator can demonstrate that a higher concentration will not pose a substantial present or potential hazard to human health or the environment (§264.94).

The third and fourth elements of the ground-water protection standard are the point of compliance and the compliance period. The compliance point is the location at which the ground-water protection standard applies and hence is the point where monitoring must occur. The regulations specify that the point of compliance is the vertical surface located at the downgradient limit of the waste management area (§264.95). The compliance period is the period during which the ground-water protection standard applies. This period is equal to the active life of the facility plus the closure period [§264.96].

After the ground-water protection standard is established, the permittee must monitor ground water to ensure that the facility continues to comply with its protection standard. If properly designed and constructed, the monitoring network established for detection monitoring should be adequate for this purpose. In addition, the permittee must sample annually for Appendix VIII constituents to detect any additional substances that may have entered ground water. Should sampling reveal a new constituent, the permit writer must amend the protection standard to include a concentration limit for the new constituent.

2.2.3 Corrective Action

If compliance monitoring reveals that a facility is exceeding its ground-water protection standard (i.e., the concentration of a hazardous

constituent in ground water exceeds the maximum limit established in the permit), the facility must institute a corrective action program. The goal of corrective action is to bring the facility back into compliance with its protection standard. To achieve this goal, the facility must develop a plan for removing the hazardous constituents or for treating the constituents in place [§264.99(i)(2)]. If approved by the Agency, the permit writer will incorporate this plan into the facility permit.

The permit writer must also include in the permit a program of ground-water monitoring adequate to demonstrate the effectiveness of the corrective action measures [§264.100(d)]. At the limit of the waste management area, this program will be essentially the same as the compliance monitoring program although permit writers may want to increase the number of wells and the frequency of monitoring at or near the compliance point where the plume appears to be concentrated. Also, owner/operators will be required to install additional monitoring wells near the downgradient edge of the plume so that the Agency can monitor the effectiveness of the corrective action program.

The permittee must implement corrective action measures until compliance with the ground-water protection standard is achieved. Once contamination has been reduced below the concentration limit set in the permit, the facility may discontinue corrective action measures and corrective action monitoring, and return to the monitoring schedule established for compliance monitoring. If compliance is not achieved before the end of the compliance period

specified in the permit, the permittee must continue corrective action until monitoring shows that the ground-water protection standard has not been exceeded for three years [§264.100(f)].

2.3 Permit Application Regulations - Part 270

Part 270 of the regulations specifies the information an applicant must submit to the Agency when applying for a permit. The information requirements related to ground-water monitoring can be organized into two basic groups. The first group, outlined in §270.14(c), establishes the nature of the facility's impact on ground water, as well as the hydrogeologic characteristics of the site's subsurface and the extent of the waste management area. The second group includes the information necessary to establish one of the three Part 264 ground-water monitoring and response programs (detection monitoring, compliance monitoring, and/or corrective action).

2.3.1 Information Requirements of §270.14(c)

Section 270.14(c) includes four basic information requirements. First, applicants must present the data collected during interim status monitoring (where applicable). If the facility has implemented a satisfactory monitoring system under interim status, these data should provide information useful for determining whether hazardous constituents have entered ground water. The Permit Applicant's Guidance Manual for Hazardous Waste Land Treatment, Storage, and Disposal Facilities (May, 1984) states that this provision requires submittal of background information to support

these data as well as the data themselves. For example, the Applicant's manual instructs owner/operators to submit:

- a map showing the location of upgradient and downgradient wells;
- a copy of the facility's sample and analysis plan;
- a description of the statistical procedure used in processing the data submitted;
- copies of water analysis results; and
- a description of the design and construction of each well.

Second, the applicant must identify the uppermost aquifer and hydraulically interconnected aquifers beneath the facility property. The application must indicate ground-water flow directions and provide the basis for the aquifer identification (i.e., a report written by a qualified hydrogeologist on the hydrogeologic characteristics of the facility property supported by at least the well drilling logs and available professional literature). This information is needed to evaluate the adequacy of the ground-water monitoring system that the applicant proposes to operate after the permit is issued. (Readers are referred to the Permit Applicant's Manual for a discussion of what constitutes an adequate hydrogeologic investigation; additional guidance will be provided by the final TEGD).

Third, §270.14(c)(3) requires the applicant to delineate the waste management area, the property boundary, and the proposed point of compliance. This information should be transposed onto a topographic map along with, to the extent possible, the designation of the uppermost and any interrelated aquifers.

Finally, §270.14(c)(4) requires applicants to describe any plume of contamination that has entered ground water by:

- o delineating the extent of the plume; and
- o identifying the concentration of each Appendix VIII constituent throughout the plume or identifying the maximum concentrations of each Appendix VIII constituent in the plume.

This requirement applies to the following three categories of facilities:

1. Facilities where no interim status monitoring data are available (e.g., waste piles, facilities that wrongly claimed a waiver from interim status ground-water monitoring requirements);
2. Facilities whose interim status data indicate contamination; and
3. Facilities whose Part 265 detection monitoring system is inadequate to determine whether or not a plume of contamination exists.

As the Permit Applicant's Guide indicates (page 9-42), the permit writer will evaluate the ability of the facility's well network and sample and analysis plan to determine the presence of a plume. If EPA determines that the interim status monitoring program was inadequate to detect contamination, the applicant will be instructed to provide the information required by §270.14(c)(4).

2.3.2 Information Requirements for Appropriate Part 264 Ground-water System

Part 270 also requires permit applicants to submit information sufficient to establish the appropriate ground-water monitoring program under Part 264. The information requirements relevant to any particular facility depend on the

status of that facility at the time of permitting. If monitoring conducted pursuant to Part 265 and Section 270.14(c)(4) has not revealed contamination, the applicant must submit the information, data, and analysis necessary to implement a detection monitoring program. If monitoring has revealed the presence of hazardous constituents in ground water at the point of compliance, the applicant must outline a program of compliance monitoring and submit a study that estimates the engineering feasibility of various forms of corrective action [§270.14(c)(7)]. Where the concentration of a hazardous constituent exceeds background or an alternate concentration level proposed by the applicant, (s)he must instead submit a detailed plan for corrective action and a description of the monitoring program intended to demonstrate the adequacy of the corrective measures [§270.14(c)(8)]. Detail concerning the specific information required to support each type of monitoring program is provided in the regulations and expanded upon in the Permit Applicant's Guidance Manual §§ 9.6 - 9.8.

CHAPTER 3

REGULATORY COMPARISONS

In order to devise enforcement strategies that are consistent with and supportive of the permitting process, it is important to have an understanding of how the Parts 265 and 264 ground-water monitoring regulations interrelate. As mentioned previously, the Agency envisioned the interim status period as a time in which to develop, among other things, the information necessary to support permitting. Indeed, one of the overall goals of interim status monitoring was to generate the data necessary to decide whether the facility permit should include a detection monitoring program, a compliance monitoring program, or a program for corrective action.

In short, the Agency envisioned a smooth transition from interim status detection monitoring, through assessment, to final permitting. A facility would proceed from one phase of monitoring to the next by building upon the monitoring system implemented during the previous stage. While interim status monitoring focused on a smaller number of constituents in order to limit the routine monitoring obligations of the owner/operator, the Agency never considered the physical well networks of the Part 265 and Part 264 programs fundamentally different. Sampling protocols and schedules would change to be consistent with the new objectives of each monitoring phase, but the physical well network (if properly designed) could serve throughout the life of a facility. A Part 265 detection system, for example, may need to be expanded to meet the needs of compliance monitoring, but with proper foresight, the existing wells need not be replaced.

Unfortunately, certain interim status monitoring systems are insufficient in quality and breadth to meet the Part 265 standards. Of those that meet the minimum standards, few have been designed in expectation of the facility's future monitoring obligations. As a result, facilities that should be close to meeting their Part 264 ground-water obligations, are in fact not prepared for the permitting process.

If enforcement officials are going to help bridge this gap, they must have a thorough understanding of exactly how the Part 265 and Part 264 regulations interrelate. To aid officials in this effort, this chapter will outline the major similarities and differences between the requirements of three ground-water monitoring programs: Part 265 detection vs. Part 264 detection; Parts 264/265 detection vs. compliance monitoring; and Part 265 assessment monitoring vs. plume characterization activities conducted pursuant to §270.14(c)(4).

3.1 Part 265 vs. Part 264 Detection Monitoring

3.1.1 Well Placement

For all practical purposes, the requirements governing well placement are the same for both Part 265 and Part 264 detection monitoring. Whereas the regulatory language differs slightly, a network designed to meet the Part 265 standard should be substantially the same (in terms of well locations and depths) as one designed to meet the Part 264 standard.

Both programs include a performance standard for background well placement that requires a sufficient number of wells, installed at appropriate

locations and depths, to yield ground-water samples that are: 1) representative of the background water quality in the uppermost aquifer; and 2) unaffected by leakage from the facility [Compare §265.91(a)(1) with §264.97(a)(1) and §264.97(a)(2)].

Both programs also include similar language regarding the placement of downgradient wells, although the Part 265 regulations require placement at the "limit of the waste management area," whereas the Part 264 regulations require placement at the "point of compliance" [cf., 265.91(a)(2) and 264.97(a)(2)]. While worded differently, the physical well location dictated by both programs is, by definition, essentially the same. The regulations define the "waste management area" as "the limit projected in the horizontal plane of the area on which waste will be placed during the active life of a regulated unit" [§264.95(b)].[5] Where there is more than one unit at a facility, the waste management area is described by an imaginary line circumscribing the various units. Hence, wells in Part 265 detection monitoring must be placed at the edge of the waste management area.

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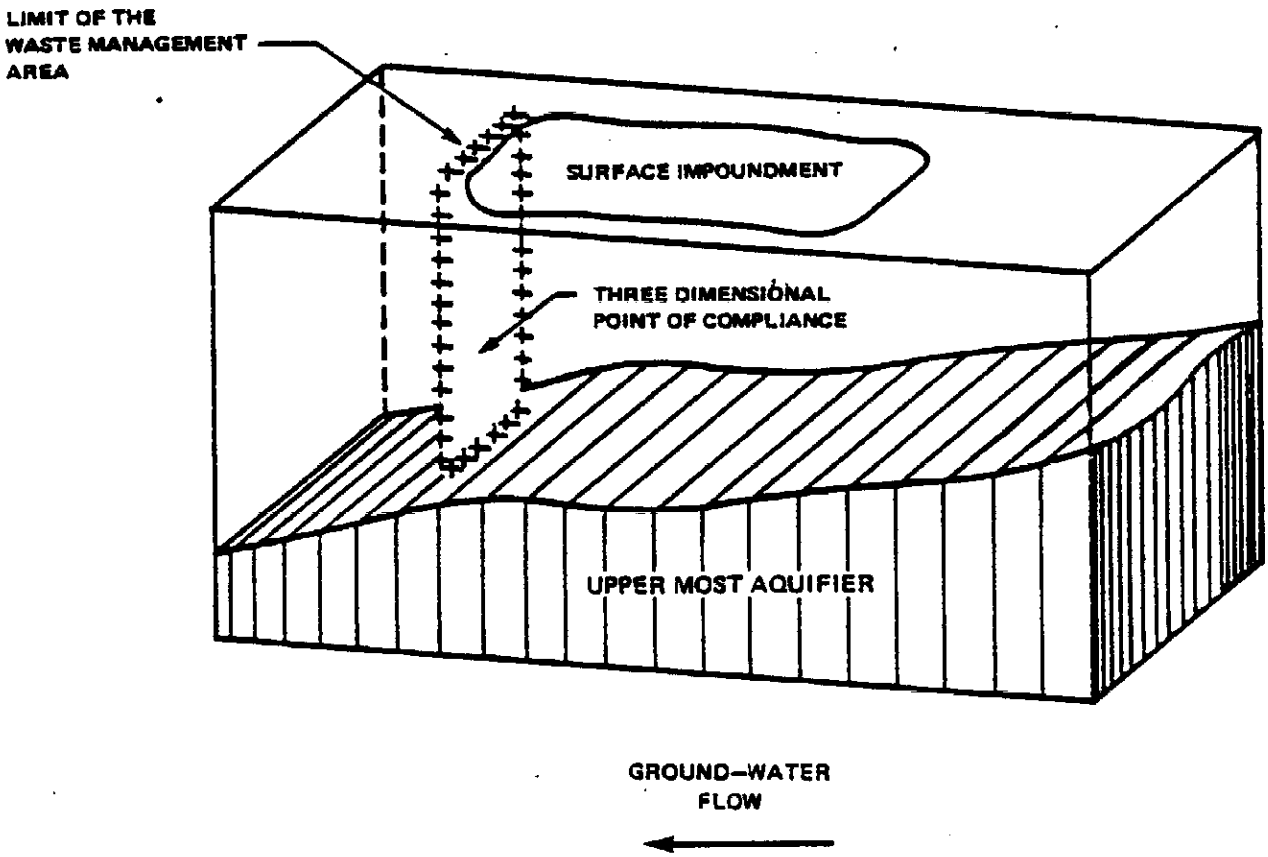
5 The Permit Applicant's Manual further qualifies this definition by noting that for Part 265 systems, EPA will evaluate the areal extent of the waste management area at an expanding facility against the regulatory mandate to choose well locations so as "to immediately detect" the migration of hazardous waste into the uppermost aquifer. For permit applications, EPA will evaluate the proposed waste management area against the policy of designing monitoring programs so as to give an early warning of the release of contaminants. In either case, EPA does not recommend that facility owners propose a waste management area whose limit is geographically remote from the active waste handling zone. Rather, monitoring wells should be closely associated with the active zone even if this means redefining the waste management area as a facility expands.

Wells in Part 264 detection must also be placed at the edge of the waste management area because the point of compliance is, by definition, the edge of the waste management area projected downward into the uppermost aquifer [see §264.95(a)]. The point of compliance is, therefore, the limit of the waste management area described in three dimensional space (See Figure 3.1). Both regulations mandate, consequently, that wells are located along the same thin land surface. Parts 265 and 264 similarly require well spacings and depths capable of detecting statistically significant contamination in the uppermost aquifer.

Figure 3.1 RELATIONSHIP OF THE WASTE MANAGEMENT AREA TO THE POINT OF COMPLIANCE



3.1.2 Indicator Parameters

The concept of sampling for parameters designed "to indicate contamination" is the same for both Parts 265 and 264 detection monitoring. The Part 265 regulations mandate the use of four specific indicators for all facilities, whereas the Part 264 regulations require the permit writer to specify a set of site-specific indicator parameters in each facility permit. The greater latitude and scope afforded by the Part 264 regulations allows the permit writer to design the detection program around the particulars of a specific facility. Rather than rely on broad, generic measures such as TOC, the permit writer can compel sampling for specific constituents known to be in the facility's waste. As a result, a Part 264 detection system can be designed to be more sensitive than the Part 265 system specified in the interim status regulations.

3.1.3 Sampling Frequency

Both the Part 265 and Part 264 regulations require quarterly sampling for one year to establish background, and at least semi-annual sampling thereafter.

3.1.4 Appropriate Sampling Techniques

The choice of the sampling device and the appropriateness of the materials used in the device are dictated by the needs of the most sensitive constituent of interest. In general, the most sensitive constituents will be volatile

organics because as a class, volatile organics are highly susceptible to degassing and chemical interference with sampling-device materials (e.g., silicon tubing). For most monitoring applications, therefore, the sampling device will be chosen to meet the needs of volatile organics.

Given that the Part 265 detection program necessarily includes a volatile organic parameter, TOX, that can be measured reliably at the 5 ppb level (see Method 9020 in "Test Methods for Evaluating Solid Waste, SW-846), sample device selection for interim status monitoring will always be dictated by the needs of volatile organics. Therefore, if a Part 264 detection program includes sampling for <u>any</u> volatile organic, then the sampling devices and materials appropriate for each program would be the same. Considering that 264 detection systems almost always contain at least one volatile organic indicator, the sampling requirements of both 265 and 264 detection monitoring will be essentially equivalent in most cases.

It is conceivable, however, that a sampling device appropriate for Part 264 sampling would NOT be appropriate for Part 265 detection if the permit writer did not require sampling for any volatile organics (e.g., if the facility were a monofill of hexavalent chromium and the permit writer elected chromium as the only Part 264 detection parameter). Such a facility could use a sampling device normally inappropriate for measuring volatile organics. If, however, a chromium waste facility ever detected contamination, the regulations require the owner/operator to sample immediately for the constituents listed in Appendix VIII (including many volatile organics). The

facility owner, therefore, would have to change sampling devices to ensure that he acquired representative samples.

Recognizing this fact, it may be in the best interest of the owner/operator to consider his/her long-term monitoring needs when purchasing sampling equipment. To the extent that facility owners purchase and use equipment for detection monitoring that will still be suitable should leakage occur, the sampling mechanisms appropriate for 265 and 264 detection monitoring once again converge.

3.1.5 Statistical Comparisons

Both the Parts 265 and 264 detection monitoring regulations require the owner/operator to determine whether there has been a statistically significant increase over background for any indicator parameter specified in the program (or decrease for pH).

The statistics used to make this determination, however, vary between the programs in two important ways. First, the Part 264 detection program requires the owner/operator to use a specific Student's t-test when defining significance (the Cochran's Approximation to the Behrens Fisher Students t-test), unless he can defend another statistical technique as substantially equivalent. The Part 265 program, on the other hand, makes no allowance for an alternate statistical technique, but the regulations do not specify a particular variant of the Student's t-test; any Student's t-test is acceptable.

Second, the Part 264 detection regulations require the test to be applied to the .05 level of significance, while the 265 regulations specify a signifi-

cance level of .01. The level of significance sets the balance between the chances of the test falsely detecting contamination ("false positive") and the test failing to identify contamination that has occurred.[6] By raising the level of significance for the Part 264 standards, the Agency achieved greater assurance that the test would not fail to detect actual contamination. During the interim status period, the Agency was willing to reduce the chances of "false positives" by accepting a slightly higher probability of failing to detect leakage. This balance was acceptable for interim status because the Agency knew it would have another opportunity to investigate possible leakage during the permit application process. For the permit regulations, however, the Agency decided that a lower level of significance would unduly compromise the ability of the test to detect contamination.

3.2 Part 264 Detection Monitoring vs. Part 264 Compliance Monitoring

3.2.1 Well Placement and Network Design

Well placements for compliance monitoring more closely resemble detection monitoring networks than they do assessment networks. One should not assume that network configurations for compliance monitoring will resemble configurations suitable for Part 265 assessment monitoring simply because both programs represent a second phase of monitoring after detection monitoring. In fact, in some cases the network installed for detection monitoring will

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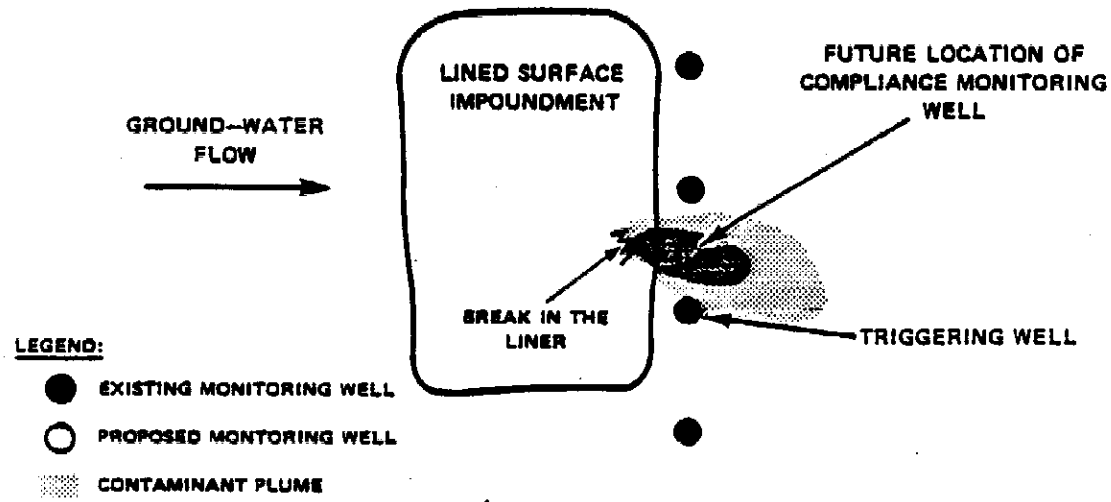
6 Readers should note that this discussion pertains to the false positive rate caused by the statistical test alone. Many other factors, such as insufficient number of background wells, can cause a facility to trigger under detection monitoring when contamination has not actually occurred. In fact, many "false positives" are not a function of statistics, but are a function of such things as well location, sampling, and chemical analysis.

become the compliance monitoring network; all that will change is the sampling protocol and the objective of the monitoring program.

Given that compliance monitoring is meant to evaluate contamination rather than just detect it, there is a strong possibility that existing detection networks may have to be expanded to meet the broader objectives of compliance monitoring. The more complicated statistical techniques used to evaluate monitoring data during compliance monitoring, for example, may require a greater number of background wells than the statistical approach used during detection monitoring. Likewise, the permit writer may want to require additional downgradient wells in the immediate vicinity of those wells where contamination has been detected.

Additional wells are generally most appropriate when contamination has been detected in only one or two monitoring wells, indicating a localized leak. With localized leaks, only a limited amount of dispersion can occur before the plume passes the point of compliance (see Figure 3.2). As a result, more wells may be necessary to ensure that measurements of contami-

Figure 3.2



nation represent the high concentrations characteristic of the plume's center, rather than the lower concentrations normally found in the plume's periphery.

In short, in some circumstances an existing detection system may have to be expanded under compliance monitoring, but the general well configurations for detection monitoring and compliance monitoring are the same.

3.2.2 Establishing Background Concentrations

The regulations specify that background concentrations for Part 265 and Part 264 detection indicator parameters must be based on quarterly samples for one year. Under compliance monitoring, however, the regulations grant the permit writer leeway on how to establish background. (Recall that background values are very important in compliance monitoring because in many instances, these background values will be incorporated into the ground-water protection standard as "concentration limits.")

The permit writer has two options for establishing background values for compliance monitoring constituents. The permit writer may establish concentration limits based on the mean of pooled background data available at the time of permitting. To ensure that sufficient data are available for this purpose, the permit writer may require the applicant to undertake an accelerated program of background sampling prior to permitting.

Alternately, if there is a high temporal correlation between up- and downgradient concentrations, the permit writer may specify that background values be established by sampling upgradient wells each time ground water is sampled at the point of compliance. With this approach, background concentra-

tions are not established by averaging values obtained over time; rather, background values are established anew after each sampling event.

3.2.3 Sampling Frequency

Since hazardous constituents are already present in ground water when compliance monitoring begins, the regulations require a more aggressive sampling schedule for compliance monitoring than for detection monitoring. Under detection monitoring, the regulations state that sampling for indicator parameters should occur at least twice a year (once background is established) [§265.92(d)(2)]. By contrast, the compliance monitoring regulations require routine sampling of the hazardous constituents listed in the facility's protection standard at least quarterly.

3.2.4 Statistical Comparisons

Whereas the regulations specify the use of a specific t-test protocol when evaluating monitoring data obtained during detection monitoring, they do not detail specific procedures for use during compliance monitoring. The compliance monitoring regulations require that the statistical procedures used be appropriate for the distribution of data encountered and provide a reasonable balance between the probability of falsely identifying and failing to identify violations of the ground-water protection standard.

Moreover, unlike detection monitoring, the compliance monitoring regulations do not establish a particular level of significance for use when making comparisons. The high number of comparisons likely in most compliance monitoring programs will increase the probability of false

positives; therefore, permit writers are granted the latitude to choose a level of significance that will strike an appropriate balance between the probability of false positives and false negatives.

3.3 Part 265 Assessment Monitoring vs. §270.14(c)(4) Plume Characterization

Both Part 265 assessment monitoring and §270.14(c)(4) require facility owners to assess any plume of contamination that has entered ground water. The programs differ, however, in two important ways.

First, the Part 265 assessment program applies only to facilities that have detected the existence of a plume through Part 265 ground-water monitoring. The §270.14(c)(4) requirements, on the other hand, apply to any facility that has not demonstrated the absence of contamination through proper Part 265 monitoring.

Second, Part 265 assessment requires monitoring for hazardous wastes or "hazardous waste constituents" [see §265.93(d)(4)], whereas §270.14(c)(4) requires sampling for "hazardous constituents." "Hazardous constituents" are those substances listed in Appendix VIII of Part 261. "Hazardous waste constituents," as defined in §260.10, are the constituents that provided the basis for listing each of the hazardous wastes identified in Part 261 Subpart D, or a constituent listed in Table 1 of §261.24 (constituents with National Interim Drinking Water Standards under the Safe Drinking Water Act).

Appendix VII identifies the specific constituent(s) responsible for the listing of wastes from the non-specific sources in §261.31 as well as

from the specific sources contained in §261.32. In the case of any of the discarded commercial chemical products, off-specification products, and spill residues listed in §261.33, the chemical product itself is considered the constituent responsible for the listing of the substance in Part 261.

Interim status assessment monitoring, therefore, requires the owner/operator to sample for any Appendix VII constituent, any substance listed in §261.33, or any substance listed in §261.24 that is in the facility's waste. Section 270.14(c)(4), on the other hand, requires sampling for the full complement of Appendix VIII constituents.

This difference between the two programs is significant. Part 265's reliance on "hazardous waste constituents" rather than on Appendix VIII constituents could mean that certain constituents in a facility's waste would not be included in a Part 265 assessment monitoring program.

A number of factors may be responsible for the exclusion of certain constituents. First, the constituents identified in Appendix VII as the basis for listing individual wastes in Part 261, are not necessarily a complete list of all hazardous constituents contained in each waste. In developing Appendix VII, EPA did not attempt to conduct an exhaustive analysis of all constituents in the waste that could have provided a basis for the listing (§261.11 provides the criteria the Administrator must use when listing a waste). Rather, the Agency identified a few of the more commonly known constituents in each waste that could pose a substantial present or potential hazard to human health or the environment.

Second, Appendix VII only applies to listed wastes; it does not address hazardous constituents that may be present in wastes deemed hazardous because they exhibit one of the characteristics in Part 261. Table 1 of §261.24 addresses wastes exhibiting the characteristic of E.P. toxicity, but "hazardous waste constituents" do not include non-listed wastes deemed hazardous because of corrosivity, reactivity, or ignitability. Moreover, Appendix VII and Table 1 of §261.24 were not developed to address the constituents that may be formed when various wastes are mixed in a regulated unit, or when wastes react with constituents in the soil. As a result, a Part 265 assessment program could conceivably fail to include a consitituent of concern at a particular facility. It must be recalled, however, that the interim status regulations were designed to be self-implementing, not exhaustive. [7]

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[7] Chapter 4 explores the various enforcement authorities available to compel sampling for Appendix VIII constituents at interim status land disposal facilities if such sampling appears necessary. Depending on the circumstances, a §3008(a) order enforcing §270.14 (c)(4), a §3013 order or a §3008(h) may be used (See section 4.1.1 for further explanation).

CHAPTER 4

OVERVIEW OF ORDER AUTHORITIES

There are a variety of order authorities available to correct ground-water problems at RCRA hazardous waste facilities. Section 3008(a) of RCRA provides for the issuance of orders and for the commencement of civil suits when any requirement of Subtitle C is violated. RCRA also establishes enforcement authorities under Sections 3004(v), 3008(h), 3013, and 7003. Any of these authorities may be used, in certain circumstances, to address ground-water problems. In addition, the enforcement authority in §106 of CERCLA may be available in many cases.[8]

While there will undoubtedly be instances where it is most appropriate to file a civil suit under §3008(a), §3008(h), or §7003, or to initiate criminal proceedings under §§3008(d) and (e), there are three order authorities that should prove most useful in addressing inadequate ground-water monitoring programs:

- o §3008(a) orders seeking penalties and/or injunctive relief for violations of Part 265 Subpart F and Part 270;
- o §3008(h) orders seeking the investigation and implementation of corrective action for releases of hazardous waste or hazardous constituents; and
- o §3013 orders seeking monitoring, investigations, analyses, and reporting by facilities that the Administrator has determined may present a substantial hazard to human health or the environment.

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[8] For further information on the applicability and scope of CERCLA 106 orders, see the September 8, 1984 memo on the "Use and Issuance of Administrative Orders under §106(a) of CERCLA" from Lee Thomas and Courtney Price.

This chapter will compare these three order authorities and will describe some of the factors that enforcement officials should consider when selecting which authority(ies) to use to compel a specific remedy.

4.1 Comparison of §3008(a), §3008(h), and §3013 Orders

The table on the two following pages presents a comparison of §3008(a), §3008(h), and §3013 orders with respect to the types of actions that the orders may compel, the types of situations that may trigger the issuance of an order, the burden of proof the Agency must satisfy, whether there are formal administrative proceedings that must be followed, and any special features of the authority (e.g., the ability to assess penalties). The section of the chart dealing with §3008(a) orders is divided into the following three segments:

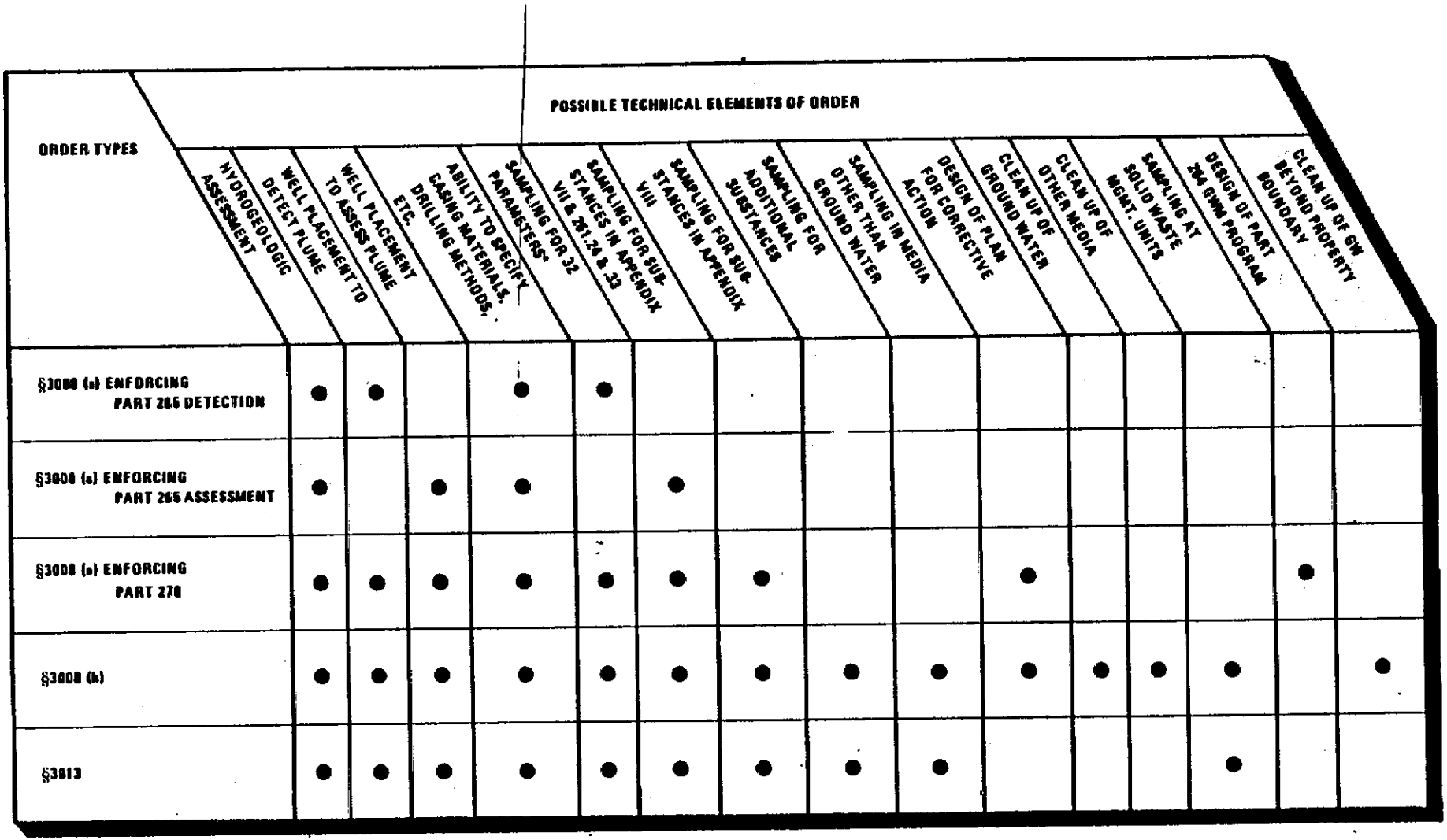
- o §3008(a) enforcing Part 265 detection monitoring
- o §3008(a) enforcing Part 265 assessment monitoring
- o §3008(a) enforcing Part 270 requirements.

4.1.1 Actions the Orders May Require

As shown in Table 4.1, a §3008(a) order enforcing Parts 265 and 270 can be used to require the following general categories of ground-water-related activities:

- o a thorough hydrogeologic characterization of the site;
- o design and installation of a well network capable of immediately detecting contamination from the facility;
- o specification of well drilling and development methods as well as casing materials;

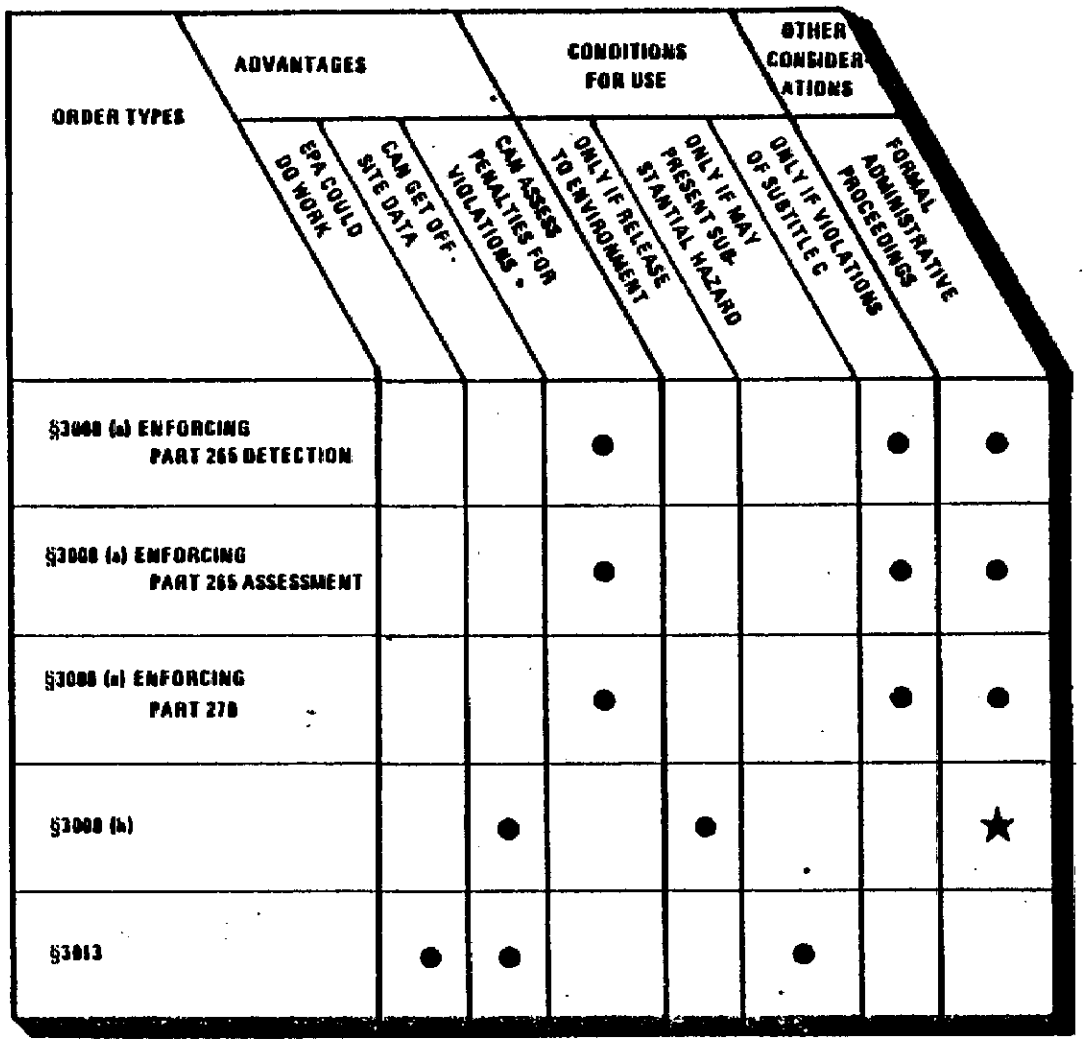
FIGURE 4.1 COMPARISON OF ORDER AUTHORITIES



NOTES:

- PARAMETER LIST INCLUDES pH, SPECIFIC CONDUCTANCE, TOC, TOX, CHLORIDE, IRON, MANGANESE, SODIUM, PHENOLS, SULFATES, AND SUBSTANCES LISTED IN APPENDIX III OF PART 265.

FIGURE 4.1 COMPARISON OF ORDER AUTHORITIES (Continued)



* THE AGENCY HAS NOT YET ESTABLISHED THE PROCEEDINGS TO BE FOLLOWED WHEN USING §3008(h) ORDERS

NOTES:

* WHEREAS § 3008(a) IS THE ONLY AUTHORITY THAT PROVIDES FOR THE ASSESSMENT OF PENALTIES FOR REGULATORY VIOLATIONS, §3008(h) AND 3013 (AS WELL AS §3008(a)) PROVIDE FOR THE ASSESSMENT OF PENALTIES IF THE TERMS OF AN ORDER ARE VIOLATED.

- o sampling for any parameter listed in Appendix VII or VIII of Part 261 or Appendix III of Part 265, or specified in §265.92 (chloride, iron, manganese, phenols; sodium, sulphate, pH, specific conductance, total organic carbon, and total organic halogen); and

- o a design of the ground-water monitoring system that would be operated after the permit is issued.

Section 3008(h) and §3013 orders can in many cases be used to obtain the same baseline injunctive relief available under §3008(a). More significantly, orders issued under §3008(h) and §3013 may be used to address contamination of media other than ground water and releases from solid waste management units. Further, §3008(h) can be used to go beyond the investigation and monitoring stage to require actual clean up of releases into the environment.

One caution with respect to §3013 and §3008(h) orders is that they may compel only those actions that are needed to investigate or address a release of hazardous waste or hazardous constituents [§3008(h)] or a substantial hazard [§3013]. While there will be cases in which the issuance of orders under those authorities is appropriate, it may in some cases be necessary to issue a simultaneous §3008(a) order to obtain compliance with Part 265/270 requirements. Further, penalties for violations of Parts 265 and 270 may be assessed only through issuance of a §3008(a) order.

4.1.2 Conditions for Order Issuance

§3008(a) Orders

A §3008(a) order may be issued only for violation of one or more Subtitle C requirements. Therefore, when enforcement personnel and the permit writer

determine a facility's ground-water monitoring program to be technically inadequate, enforcement personnel should determine whether any of the technical inadequacies constitute violations of Part 265 Subpart F or Part 270.[9]

In some cases the regulations are specific as to what findings of fact would indicate violations. For example, if an owner/operator has installed only two downgradient wells, the facility is clearly out of compliance with §265.91(a)(2) of the regulations, the section that requires installation of at least three downgradient wells. Likewise, if a facility does not have some of the records specified in the regulations (e.g., an assessment outline), or has not performed some of the required analyses, then the owner is clearly in violation. The decision concerning the existence of a violation becomes more involved when it is based upon evaluating the adequacy of a facility's ground-water monitoring system beyond the minimum requirements.

In great part, the heightened level of analysis required to evaluate the overall adequacy of a system evolves from the regulations' reliance on broad performance standards. Given the great variability between sites in terms of wastes handled, hydrogeology, and climate, it is impossible to design a regulatory system that defines for all cases exactly what constitutes an adequate ground-water monitoring program. As a result, the Agency relies on performance standards to define "adequate."

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[9] As cited, herein, references to Part 265, Subpart F and Part 270 include requirements of authorized State programs.

The performance-oriented provisions of Subpart F set high standards for interim status ground-water monitoring systems, and enforcement personnel should not underestimate the power and applicability of this language. For example, even though the regulations establish a minimum of one background monitoring well, a single well is seldom sufficient because owner/operators must design their systems to meet the background-well performance standard listed in §265.91(a)(1). Section 265.91(a)(1) requires owner/operators to install a sufficient number of wells at appropriate locations and depths to yield samples representative of background water quality not affected by the facility. If a facility's well array does not meet this standard, the owner/operator is out of compliance with the regulations. Figure 4.2 summarizes the Part 265 and Part 270 performance standards relating to ground-water monitoring.

Figure 4.3, on pages 4-9 through 4-14, illustrates in greater detail the relationship between certain technical inadequacies of ground-water monitoring programs and the regulatory performance standards of RCRA. The left-hand side of the table lists a series of standards that must be met in order to meet the the performance standards summarized in Figure 4.2 (e.g., background-well samples must be unaffected by the facility). The middle column includes examples of technical inadequacies that could prevent a system from meeting the left-hand standards and therefore could represent a violation of one or more of the performance standards (e.g., failure to consider flow paths of dense immiscibles when locating background wells). Finally, the right-hand column lists for each technical inadequacy the performance standard(s) that may have been violated.

FIGURE 4.2

GROUND-WATER PERFORMANCE STANDARDS
PARTS 265 and 270

CITATION	STANDARD
§265.90(a)	the owner/operator of a land disposal facility must implement a ground-water monitoring program "capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility,..." (emphasis added)
§265.91(a)	a ground-water monitoring system "must be capable of yielding ground-water samples for analysis..."
§265.91(a)(1)	the number, locations, and depths of background monitoring wells must be "sufficient to yield ground-water samples that are: (i) Representative of background ground-water quality in the uppermost aquifer near the facility; and (ii) Not affected by the facility..."
§265.91(a)(2)	the number, locations, and depths of downgradient monitoring wells must ensure that they "immediately detect any statistically significa amounts of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer." (emphasis added)
§265.93(d)(4)	an assessment monitoring plan must be capable of determining: "(i) Whether hazardous waste or hazardous waste constituents have entered the ground water; (ii) The rate and extent of migration of hazardous waste or hazardous waste constituents in the ground water..."
§270.14(c)(2)	the Part B applicant must submit, among other things, an "identification of the uppermost aquifer and aquifers hydraulically interconnected beneath the facility property, including ground-water flow direction and rate, and the basis for such identification (i.e., the information obtained from hydrogeologic investigations of the facility area)." (emphasis added)
§270.14(c)(4)	the Part B applicant must include in the submittal a "description of any plume of contamination that has entered the ground water from a regulated unit at the time that the application was submitted that: (i) delineates the extent of the plume..., (ii) identifies the concentration of each Appendix VIII... constituent...throughout the plume..." (emphasis added)

FIGURE 4.3

RELATIONSHIP OF TECHNICAL INADEQUACIES TO GROUND-WATER PERFORMANCE STANDARDS

Examples of Basic Elements Required by Performance Standards	Examples of Technical Inadequacies that may Constitute Violations	Regulatory Citations
1. Uppermost Aquifer must be correctly identified	• failure to consider aquifers hydraulically interconnected to the uppermost aquifer	§265.90(a) §265.91(a)(1) (a)(2) §270.14(c)(2)
	• incorrect identification of certain formations as confining layers or aquitards	§265.90(a) §265.91(a)(1) (a)(2) §270.14(c)(2)
	• failure to use test drilling and/or soil borings to characterize sub-surface hydrogeology	§265.90(a) §265.91(a)(1) (a)(2) §270.14(c)(2)
2. Ground-water flow directions and rates must be properly determined	• failure to use piezometers or wells to determine ground-water flow rates and directions (or failure to use a sufficient number of them)	§265.90(a) §265.91(a)(1) (a)(2) §270.14(c)(2)
	• failure to consider temporal variations in water levels when establishing flow directions (e.g., seasonal variations, short-term fluctuations due to pumping)	§290.90(a) §295.91(a)(1) (a)(2) §270.14(c)(2)
	• failure to assess significance of vertical gradients when evaluating flow rates and directions.	§265.90(a) §295.91(a)(1) (a)(2) §270.14(c)(2)
	• failure to use standard/consistent benchmarks when establishing water level elevations	§265.90(a) §265.91(a)(1) (a)(2) §270.14(c)(2)
	• failure of the O/O to consider the effect of local withdrawal wells on ground-water flow direction	§265.90(a) §265.91(a)(1)
	• failure of the O/O to obtain sufficient water level measurements	§265.90(a) §265.91(a)(1)

FIGURE 4.3 (continued)

Examples of Basic Elements Required by Performance Standards	Examples of Technical Inadequacies that may Constitute Violations	Regulatory Citations
3. Background wells must be located so as to yield samples that are not affected by the facility	• failure of the O/O to consider the effect of local withdrawal wells on ground-water flow direction	§265.90(a) §265.91(a)(1)
	• failure of the O/O to obtain sufficient water level measurements	§265.90(a) §265.91(a)(1)
	• failure of the O/O to consider flow path of dense immiscibles in establishing upgradient well locations	§265.90(a) §265.91(a)(1)
	• failure of the O/O to consider seasonal fluctuations in ground-water flow direction	§265.90(a) §265.91(a)(1)
	• failure to install wells hydraulically upgradient, except in cases where upgradient water quality is affected by the facility (e.g., migration of dense immiscibles in the upgradient direction, mounding of water beneath the facility)	§265.90(a) §265.91(a)(1)
	• failure of the O/O to adequately characterize subsurface hydrogeology	§265.90(a) §265.91(a)(1)
	• wells intersect only ground water that flows around facility	§265.90(a) §265.91(a)(1)
4. Background wells must be constructed so as to yield samples that are representative of in-situ ground-water quality	• wells constructed of materials that may release or sorb constituents of concern	§265.90(a) §265.91(a)
	• wells improperly sealed—contamination of sample is a concern	§265.90(a) §265.91(a) §265.91(c)
	• nested or mulitple screen wells are used and it cannot be demonstrated that there has been no movement of ground water between strata	§265.90(a) §265.91(a)(1) §265.91(a)(2)
	• improper drilling methods were used, possibly contaminating the formation	§265.90(a) §265.91(a)
	• well intake packed with materials that may contaminate sample	§265.90(a) §265.91(a) §265.91(c)

FIGURE 4.3 (continued)

Examples of Basic Elements Required by Performance Standards	Examples of Technical Inadequacies that may Constitute Violations	Regulatory Citations
Background wells must be constructed so as to yield samples that are representative of in-situ ground-water quality. (continued)	• well screens used are of an inappropriate length	§265.90(a) §265.91(a)(1) §265.91(a)(2)
	• wells developed using water other than formation water	§265.90(a) §265.91(a)
	• improper well development yielding samples with suspended sediments that may bias chemical analysis	§265.90(a) §265.91(a)
	• use of drilling muds or nonformation water during well construction that can bias results of samples collected from wells	§265.90(a) §265.91(a)
5. Downgradient monitoring wells must be located so as to ensure the immediate detection of any contamination migrating from the facility	• wells not placed immediately adjacent to waste management area	§265.90(a) §265.91(a)(2)
	• failure of O/O to consider potential pathways for dense immiscibles	§265.90(a) §265.91(a)(2)
	• inadequate vertical distribution of wells in thick or heavily stratified aquifer	§265.90(a) §265.91(a)(2)
	• inadequate horizontal distribution of wells in aquifers of varying hydraulic conductivity	§265.90(a) §265.91(a)(2)
	• likely pathways of contamination (e.g., buried stream channels, fractures, areas of high permeability) are not intersected by wells	§265.90(a) §265.91(a)(2)
	• well network covers uppermost but not interconnected aquifers	§265.90(a) §265.91(a)(2)
6. Downgradient monitoring wells must be constructed so as to yield samples that are representative of in-situ ground-water quality	See #4	

Examples of Basic Elements Required by Performance Standards	Examples of Technical Inadequacies that may Constitute Violations	Regulatory Citations
7. Samples from background and down-gradient wells must be properly collected and analyzed	• failure to evacuate stagnant water from the well before sampling	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• failure to sample wells within a reasonable amount of time after well evacuation	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• improper decisions regarding filtering or non-filtering of samples prior to analysis (e.g., use of filtration on samples to be analyzed for volatile organics)	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• use of an inappropriate sampling device	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• use of improper sample preservation techniques	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• samples collected with a device that is constructed of materials that interfere with sample integrity	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• samples collected with a non-dedicated sampling device that is not cleaned between sampling events	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• improper use of a sampling device such that sample quality is affected (e.g., degassing of sample caused by agitation of bailer)	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)

FIGURE 4.3 (continued)

Examples of Basic Elements Required by Performance Standards	Examples of Technical Inadequacies that may Constitute Violations	Regulatory Citations
Samples from background and downgradient wells must be properly collected and analyzed (continued)	• improper handling of samples (e.g., failure to eliminate headspace from containers of samples to be analyzed for volatiles)	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• failure of the sampling plan to establish procedures for sampling immiscibles (i.e., "floaters" and "sinkers")	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• failure to follow appropriate QA/QC procedures	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• failure to ensure sample integrity through the use of proper chain-of-custody procedures	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• failure to demonstrate suitability of methods used for sample analysis (other than those specified in SW-846)	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• failure to perform analysis in the field on unstable parameters or constituents (e.g., pH, Eh, specific conductance, alkalinity, dissolved oxygen)	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• use of sample containers that may interfere with sample quality (e.g., synthetic containers used with volatile samples)	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)
	• failure to make proper use of sample blanks	§265.90(a) §265.92(a) §265.93(d)(4) §270.14(c)(4)

Examples of Basic Elements Required by Performance Standards	Examples of Technical Inadequacies that may Constitute Violations	Regulatory Citations
8. In Part 265 assessment monitoring the O/O must sample for the correct substances	• failure of the O/O's list of sampling parameters to include certain wastes that are listed in §261.24 or §261.33, unless adequate justification is provided	§265.93(d)(4)
	• failure of the O/O's list of sampling parameters to include Appendix VII constituents of all wastes listed under §§261.31 and 261.32, unless adequate justification is provided	§265.93(d)(4)
9. In defining the Appendix VIII makeup of a plume the O/O must sample for the correct substances	• failure of the O/O's list of sampling parameters to include all Appendix VIII constituents, unless adequate justification is provided	§270.14(c)(4)
10. In Part 265 assessment monitoring and in defining the Appendix VIII makeup of a plume the O/O must use appropriate sampling methodologies	• failure of sampling effort to identify areas outside the plume	§265.93(d)(4) §270.14(c)(4)
	• number of wells was insufficient to determine vertical and horizontal gradients in contaminant concentrations	§265.93(d)(4) §270.14(c)(4)
	• total reliance on indirect methods to characterize plume (e.g., electrical resistivity, borehole geophysics)	§265.93(d)(4) §270.14(c)(4)
11. Part B applicants who have either detected contamination or failed to implement an adequate part 265 GWM program must determine with confidence whether a plume exists and must characterize any plume	• failure of O/O to implement a monitoring program that is capable of detecting the existence of any plume that might emanate from the facility	§270.14(c)(4)
	• failure of O/O to sample both upgradient and downgradient wells for all Appendix VIII constituents See also items #1, #2	§270.14(c)(4)

The technical inadequacies in Figure 4.3 are not necessarily violations in all cases. They are violations only when they result in a failure of the facility to meet one or more of the performance standards. Further, the list of technical inadequacies is not meant to be exhaustive. To a certain degree, the decision as to whether a facility's monitoring program is adequate must be made on a case-by-case basis.

§3013 Orders

Section 3013 orders may be issued to a facility only when the Administrator determines that the presence or release of hazardous waste at the facility may present a substantial hazard to human health or the environment. The facility need not be violating RCRA regulations to qualify for action under §3013.

Actual physical evidence of contamination is not necessary to support a §3013 order. In the case of a facility that has not conducted any ground-water monitoring activities, the potential for release of hazardous waste, the nature of the site's underlying hydrogeology, and the proximity of an aquifer or populated area will usually be sufficient, with expert opinion, to support a §3013 order. In some cases, the Region may wish to use §3007 authority to sample one or more wells at a facility in order to provide direct evidence of a release. Given that direct evidence is often unnecessary to establish the applicablity of §3013, the Region should probably avoid direct sampling unless it is confident that existing wells will intersect the suspected plume. Guidance issued September 26, 1984 provides further discussion of the grounds for issuance of §3013 orders. (See memo from Courtney Price and

Lee Thomas entitled, "Issuance of Administrative Orders Under Section 3013 of the Resource Conservation and Recovery Act").

§3008(h) Orders

Section 3008(h) of RCRA provides that the Administrator may issue an order or file a civil suit requiring corrective action or other appropriate response measures whenever (s)he determines that there is or has been a release of hazardous waste into the environment. Section 3008(h) actions are not limited to violations of RCRA.

As described in the September 1985 draft guidance on the scope and use of §3008(h), the Agency is interpreting the term "release" to include any spilling, leaking, pumping, pouring, emitting, erupting, discharging, injecting escaping, leaching, dumping, or disposing into the environment. To show that a release has occurred, the Administrator does not necessarily need sampling data. Such evidence as a broken dike at a surface impoundment should also support a determination that a release has occurred. In some cases, information on the contents of a land disposal unit, along with information on the site hydrogeology and the design and operating characteristics of the facility may be enough for an expert to conclude that a release has occurred.

Section 3008(h) orders (and civil suits) may be used to address releases not only to the ground water, but to other media as well. The draft §3008(h) guidance states that the authority covers releases of hazardous wastes into

surface water, air, the land surface, and the sub-surface strata.' The term "hazardous waste" is not limited to those wastes listed or identified in 40 CFR Part 261. For §3008(h) purposes, the term hazardous waste also includes the hazardous constituents identified in Appendix VIII of Part 261.

4.1.3 Formal Administrative Proceedings

Orders issued and penalties assessed under §3008(a) are subject to formal administrative proceedings. Section 3008(a) proceedings are governed by 40 CFR Part 22. (See Appendix B for a diagram of the process). The Agency has not yet established the proceedings to be followed when issuing §3008(h) orders.

Part 22, which governs the issuance of §3008(a) orders, sets out a process that affords a respondent the opportunity to request a hearing on the violation, the penalty, and the remedy proposed by the Agency. Following any such hearing, the Administrative Law Judge will issue an Initial Decision that includes a proposed Final Order and may include a proposed penalty. At that point the respondent has 20 days in which to appeal the Initial Decision to the Administrator. If an appeal is not made within this time period the order becomes final and non-appealable 45 days after issuance of the Initial Decision.

Section 3013 orders are not subject to any formal administrative proceedings.

4.2 Selection Among Order Authorities

There are a number of factors that should be considered when deciding which order authority(ies) to invoke. The enforcement staff should consider first which order authorities are applicable to the actions, inactions, or conditions involved. Next, the Region should consider which of the applicable authorities provide a legal basis for requiring the remedy that the Region is seeking, including the assessment of penalties. Figure 4.1 may be consulted for a general listing of the activities that can be sought under each authority.

In most cases, there will be several options that meet the tests of applicability and coverage of the desired remedy. The enforcement options can be further narrowed by considering: 1) the strength of the evidence in support of each type of order; 2) the elements that must be established and whether they refer to regulations or must be established de novo; 3) the amount of time that is likely to pass before compliance is achieved; and 4) any complications that might arise from using certain combinations of authorities.

When estimating the amount of time that may pass before compliance with a §3008(a) order is achieved, the Regions should assess the probability of the facility appealing the order. This is particularly important where action needs to be taken quickly in order to halt or avoid a hazard or endangerment. If the facility is likely to challenge a §3008(a) order in the District Court, the Agency might elect to file a civil suit seeking preliminary injunctive relief or to issue a §3013 order (if the §3013 test could be met). Alternatively, the Agency could take action itself to

mitigate an immediate threat to public health or the environment under CERCLA §104.

When contemplating using two authorities to compel different aspects of the desired remedy, enforcement officials should keep in mind the different procedures that accompany each order. For instance, there may be cases in which a Region would consider issuing simultaneous §3008(a) and §3013 orders: a §3008(a) order to compel proper well placement and assess penalties and a §3013 order to compel sampling for constituents not listed in Parts 260-270. While simultaneous issuance of these orders is acceptable, the Region should be aware that one order is subject to administrative hearings and the other is not; therefore, appeal of the §3008(a) order may delay the full implementation of the remedy.

In general, a §3008(a) order enforcing Parts 265 and 270 and assessing penalties will be the most practical enforcement option. Such an order can be used to attain nearly any desired improvement to a ground-water monitoring program. It can also be used, as noted in Section 1.2.1, to require a facility to sample the ground water for constituents listed in Appendix VIII of Part 261.

Section 3013 and §3008(h) orders also have several common features that make them particularly attractive in certain circumstances. Both order authorities may be used to address contamination of media other than ground water. For example, either order could be used to address facilities with both ground-water and air problems. Moreover, unlike §3008(a) orders, §3008(h) and §3013 orders are not bound by the ground-water monitoring regimen specified in the regulations. Therefore, the Agency has more flexibility in

specifying monitoring parameters and sampling frequencies when issuing §3013 and §3008(h) orders.

Each order authority also has unique features that may make it particularly appropriate for certain situations. Section 3013, for example, grants the Agency the authority to perform investigatory activities and recover costs later if a respondent is incapable of or refuses to perform the necessary actions. Section 3008(h) does not provide for cost recovery, but can be used to compel facilities to go beyond the investigation stage and take corrective action if necessary. In addition, §3008(h) orders can be used to address past releases from solid waste management units and contamination extending beyond the facility boundary.

CHAPTER 5

FASHIONING A REMEDY AND DEVELOPING THE ENFORCEMENT STRATEGY

The first and perhaps most important step in developing an enforcement action for a facility with ground-water monitoring problems is fashioning an appropriate remedy. Only after outlining the desired remedy can the Region design an enforcement strategy that will best achieve the desired results.

This chapter will describe several scenarios involving problem monitoring programs and, using one common scenario as an example, will illustrate some of the principles that enforcement officials should consider when designing technical remedies. Then, using the same violator as an example, the chapter will design an enforcement strategy to compel the model remedy.

5.1 Types of Violators

Each ground-water case will, of course, have unique features. It is possible, however, to group RCRA ground-water violators into several broad categories that characterize the status of the facility at the time of enforcement review. Figure 5.1 outlines one possible scheme that divides facilities into groups based on a combined evaluation of their Part 265 system and the adequacy of their permit application. This scenario will be used later in Figure 5.3 to illustrate possible remedies and enforcement strategies for facilities with different types of ground-water violations.

The assumption in this scheme is that all the facilities listed are in violation of Part 270 because they did not generate the information necessary for permitting. In some cases, this deficiency derives from inadequate

compliance with Part 265 (facilities that have inadequate 265 detection systems, for example, will not have generated the information necessary to determine whether the facility should be permitted under detection monitoring, compliance monitoring, or corrective action). In other cases, facilities may have complied with 265, but not have completed all activities required by the permit application regulations (e.g., the facility performed some assessment activities based on Appendix VII, but did not sample for Appendix VIII as required by §270.14(c)(4)).

FIGURE 5.1

Violator Classification Scheme

Scenario	Facility Status	Possible Sources of Inadequacy
1.	No statistically significant change in Part 265 indicator parameters; Physically adequate detection network; Agency has reason to believe there is contamination.	Part 265 indicator parameters are not adequate to detect type of leachate expected from facility; site hydrogeology or facility's engineering design puts facility at high risk of leaking.
2.	No statistically significant change in Part 265 indicator parameters; Inadequate Part 265 detection system.	Well placements made based on insufficient hydrogeologic assessment; Too few wells; Inappropriate sampling device; Wells not properly developed, etc.
3.	Statistically significant change in Part 265 indicator parameters; Inadequate Part 265 detection system; Inadequate Part 265 assessment.	Owner/operator used only indirect techniques to assess plume.
4.	Statistically significant change in Part 265 indicator parameters; Adequate Part 265 assessment; Inadequate permit application.	Owner failed to identify all Appendix VIII constituents in ground water; Owner based concentration limits on insufficient background sampling; Owner failed to submit a feasibility plan for corrective action, etc.

5.2 Profile of a "Transition-Period" Violator

During the transition period between interim status and permitting, the Agency envisions encountering a considerable number of facilities of the type described in Scenario 2 (Figure 5.1). The Agency's experience to date has indicated that in certain cases, owner/operators have installed monitoring networks based on only a limited understanding of the hydrogeology underlying their site. Monitoring wells have been located based on an evaluation of local topography and, to the extent possible, evaluation of existing building foundation borings. A considerable number of owner/operators have not performed the type of detailed hydrogeologic site assessment the Agency considers essential for the design of any ground-water monitoring system. Even fewer have kept the type of well construction and design records the Agency needs to evaluate the adequacy of the physical well network already in place.

As a result, EPA expects to encounter owner/operators who consider themselves in compliance but who can not provide the background information and documentation minimally necessary to substantiate the adequacy of their Part 265 detection system. Without such information, the Agency will not be able to decide whether a facility's detection system is or is not capable of detecting contamination and hence whether the facility should be permitted under detection monitoring, compliance monitoring or corrective action. Not having detected a change in indicator parameters, however, the facility most likely will have applied for a detection monitoring permit, considering itself exempt from the assessment requirements of §270.14(c)(4).

A typical "transition" facility, therefore, could be characterized as follows:

- the facility has failed to adequately characterize the hydrogeology underlying its site;
- therefore, the facility's well placements are inaccurate;
- the facility has sampled for the Part 265 indicator parameters. No statistically significant increases have been detected in existing downgradient wells;
- the facility's Part B is due. The facility has submitted a summary of its interim status monitoring data and has proposed an expanded list of indicator parameters for Part 264 monitoring. The permit application includes procedures for establishing background values for these parameters, but does not include actual background values based on pre-permit sampling.

This chapter will use the above scenario to illustrate some of the principles enforcement officials should consider when designing remedies for facilities during the interim status to permitting transition period. The chapter uses Scenario 2 as its point of departure because a facility that has not detected contamination under interim status presents the greatest challenge to enforcement officials. Moreover, the remedies appropriate for the other scenarios presented in Figure 5.1 are but a variation of the remedy outlined in the following section for the facility described in Scenario 2.

Table 5.5 at the end of the chapter summarizes the variations on the remedy appropriate for each of the other listed scenarios.

5.3 Outline of the Remedy

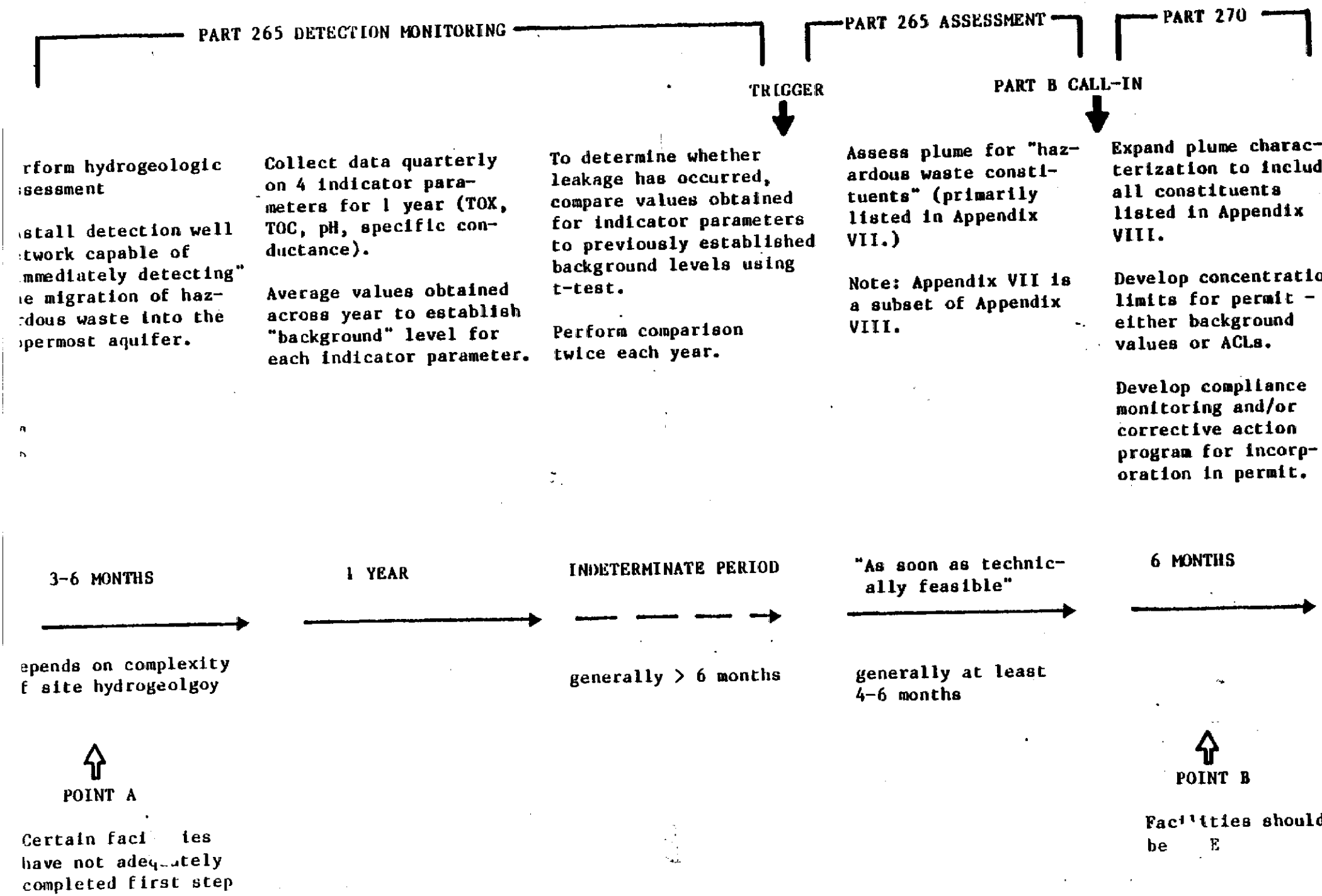
When faced with a facility that has a technically inadequate detection monitoring system, enforcement and permitting officials must consider first

what makes sense for a facility to do in light of the facility's past and future monitoring obligations. By this point in the program, an interim status facility should have installed a fully competent detection monitoring system, determined with confidence whether there was a statistically significant indication of ground-water contamination, and fully characterized any plume for both Appendix VII and VIII constituents (if contamination were detected). If a facility has not successfully completed even the first step - the installation of a competent detection system - it cannot be allowed to begin the entire sequence anew. Proceeding from the beginning would mean upgrading the detection system and sampling for one year to establish background before even the first determination of contamination is made.

As the time line in Figure 5.2 points out, proceeding through this entire sequence could take up to two and one-half years. This approach would lead to unacceptable delays in the permitting process and would penalize those facilities who had complied with the program all along. In effect, "starting over" would merely allow facilities that had avoided the costs of complying in the past, to delay the costs of full compliance for an additional period of time.

Instead, such facilities should be required to make an accelerated determination of whether or not contamination has occurred. This determination can then be used to decide what additional actions, if any, the applicant must perform to meet his/her permit application requirements.

Figure 5.2 GROUND-WATER MONITORING SEQUENCE AS ORIGINALLY ENVISIONED



Before a determination of leakage can be made, the facility must install a monitoring network capable of detecting contamination. In general, this will require such facilities to perform additional site characterization and then, based on the results, expand or replace their existing monitoring network. Once a competent detection network is in place, the facility is in a position to determine whether or not contamination has occurred.

The Agency suggests that the determination of whether contamination has occurred be made based on a comparison of upgradient and downgradient values obtained for an expanded list of indicator parameters. The indicator parameters should be selected based on the specifics of the site and should include constituents that would be expected to be at the leading edge of any plume of contamination (see Section 5.4.2). The comparison should be based on the mean of pooled data obtained through accelerated sampling over a short period of time. The plan for this determination should be designed to conclusively confirm or refute contamination in the shortest period of time possible.

If contamination <u>has</u> occurred, the facility owner must proceed to characterize the plume and, based on the results, apply for either an operating or post-closure permit that includes compliance monitoring and/or corrective action. If contamination has <u>not</u> occurred (i.e. the results of interim status monitoring were correct even though the detection system was not fully competent), then the facilty would apply for a permit as a detection monitoring facility.

Thus the preferred technical response for a facility that has not triggered under detection monitoring but has an inadequate Part 265 detection system is as follows:

1) Conduct a detailed assessment of the site's hydrogeology (fill in gaps in the facility's current understanding of the site's subsurface).

2) Install a monitoring network (or modify/expand an existing system) to meet the objectives of Parts 265/264 detection monitoring.

3) Sample for an expanded list of indicator parameters.

4) Determine whether contamination has occurred based on a comparison of upgradient and downgradient well samples obtained over a short period of time (accelerated sampling).

5) If contamination is confirmed, begin characterizing the plume based on monitoring of Appendix VIII constituents.

6) Sample to establish background for all Appendix VIII constituents detected in ground water.

7) If downgradient Appendix VIII values are significantly greater than background values, have facility develop corrective action plan and apply for corrective action permit.[10]

   If downgradient Appendix VIII values are lower than background, have facility submit a corrective action feasibility study[11] and apply for a compliance monitoring permit.

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10 Note that if the permit is not likely to be issued quickly, the Agency may wish to initiate corrective action while the facility is still in interim status. Several authorities are available to compel such corrective action, including §3008(h), §7003 and Section 106 of CERCLA. Further, in some instances, the Agency may choose to conduct a response action under the authority of CERCLA §104.

11 Section 270.14(c)(7) requires applicants to submit a corrective action feasibility study when applying for a compliance monitoring permit. The study must include sufficient information to predict what type of corrective action (e.g., trench recovery, pumping and treatment) would be appropriate if remedial work proved necessary at that site. It is not meant to be a fully developed plan for corrective action; such a plan must be developed pursuant to §264.99(i)(2) if the facility ever exceeds its ground-water protection standard.

The schedule of achieving the above remedy will of course depend on the particulars of the site involved, especially the complexity of the site's hydrogeology. While it is impossible to predict how long it will take (or should take) to accomplish each step, the sequence of monitoring events in this remedy should be significantly shorter than the sequence laid out in the regulations.

As illustrated in Figure 5.3, the remedy recommended in this document in effect eliminates the collection of a year's worth of background data and condenses the monitoring required by Part 265 assessment [primarily Appendix VII] and §270.14(c)(4) [Appendix VIII] into one plume characterization phase. Now confirmation (or denial) of leakage can be accomplished through accelerated sampling over a period of weeks or months rather than taking over a year.

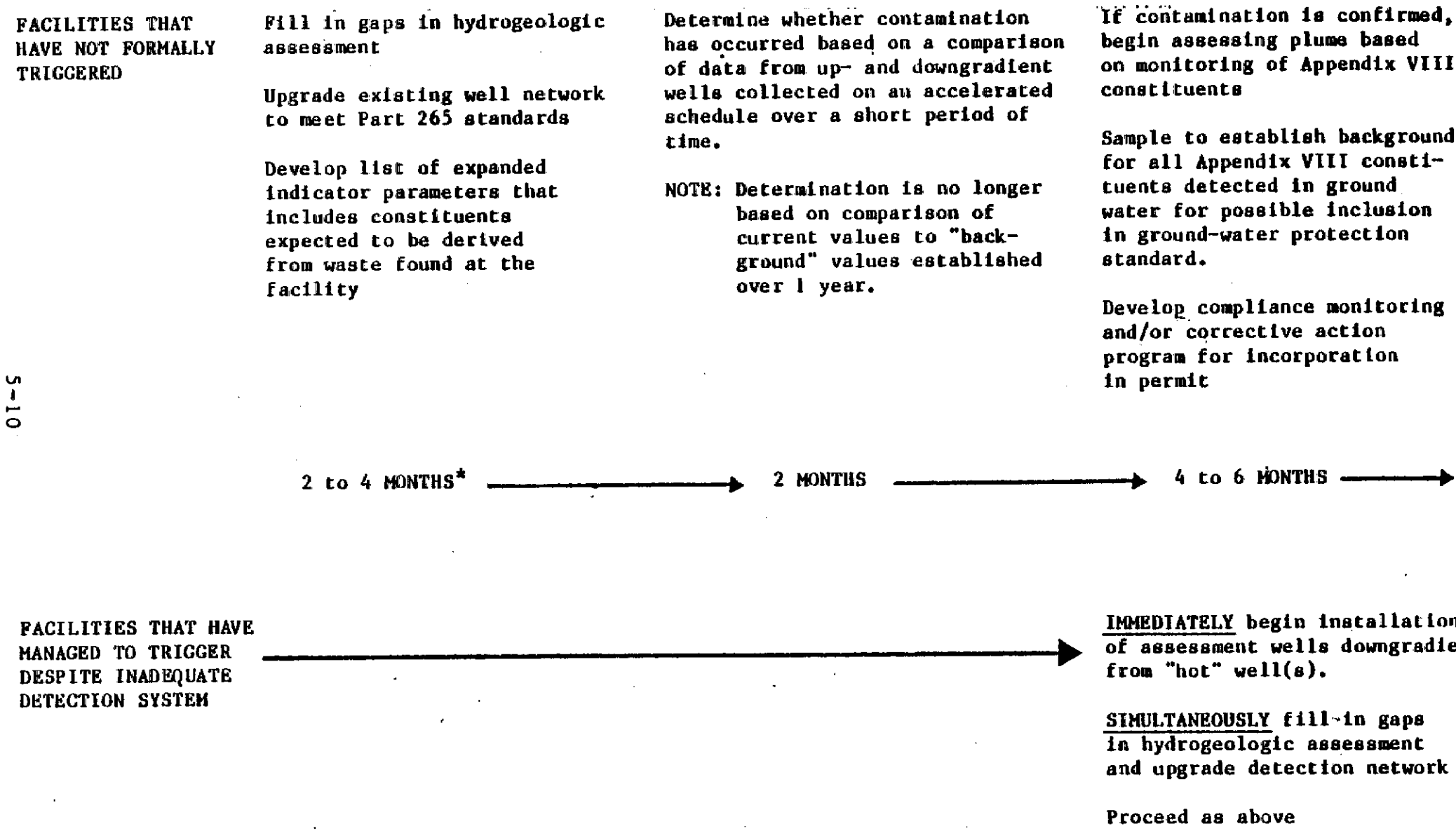
5.4 Discussion of the Remedy

The basic elements of the remedy are the design and installation of a competent detection monitoring well network; determination of whether or not leakage has occurred based on sampling for an expanded list of parameters; and the fulfillment of all applicable Part 270 informational requirements. The following section will describe briefly certain factors enforcement officials should keep in mind when developing each aspect of the remedy. Later sections will explore the order and regulatory authorities available to compel each of the outlined activities.

5.4.1 Design and Installation of a Competent Monitoring Network

The facility owner should be required to upgrade his/her existing network to meet the detection standards of Part 265. The reader should note that if

Figure 5.3 NEW GROUND-WATER COMPLIANCE STRATEGY BASED ON CONDENSED MONITORING SEQUENCE



* Time frame will vary depending on site-specific factors

an owner/operator's hydrogeologic data submitted pursuant to §270.14(c)(2) is inadequate, it is likely that the facility's detection monitoring well network is inadequate as well. The reader should also note that since the the design and construction standards for a Part 265 system are essentially the same as those required by Part 264 (see Chapter 3), the network installed for the determination of leakage proposed in the model remedy should serve equally well as the facility's Part 264 detection monitoring system if no plume is found.

5.4.2 Confirmation of Leakage Based on Expanded Sampling

Central to the determination of leakage proposed in the model remedy is the development of a list of meaningful indicator parameters. When selecting parameters, enforcement officials should not limit themselves to the four indicators listed in §265.90.[12] These parameters were selected as the best indicators available to detect a broad spectrum of possible leachates. Because the interim status regulations were meant to be self-implementing, Part 265 detection monitoring could not rely on waste-specific indicators selected for each facility. As a result these parameters are limited in their ability to indicate contamination soon after leakage.

The Part 265 indicator parameters are limited in three ways. First, the Part 265 indicator parameters are subject to sources of natural variation that can mask the presence of low levels of contamination. There are many natural sources of variation in pH, for example, that could obscure changes

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12 See Section 5.5.2 for an explanation of the authorities available to compel sampling for a broader list of parameters.

in this parameter caused by leachate. Changes in levels of a specific parameter such as benzene, however, are not generally subject to such background "noise." Second, with the exception of TOX (which can be detected at below 20 ppb), the lower detection limit of the other parameters is not sufficiently sensitive to register some changes in water chemistry that may represent leakage. Finally, because the Part 265 indicator parameters are surrogate measures, increases in a particular chemical constituent do not necessarily cause an equivalent change in an indicator parameter. A 5 mg/l change in lead, for example, would only initiate a very small change in specific conductance (if any). The same increase in concentration would initiate a significant change, however, if the facility were sampling for lead itself.

Therefore, enforcement officials should select indicator parameters that are based on the chemical composition of the facility's waste. The enforcement official should have the facility identify both the hazardous and non-hazardous constituents of the facility's waste, including any constituents likely to form as a result of chemical reactions occurring in the facility or in the leachate as it migrates through the subsurface. Then the owner/operator should identify those constituents that can be considered the most mobile and persistent in the unsaturated and saturated zones beneath the facility. The enforcement official should then select those parameters that individually or as a group (e.g. TOX) can provide the most reliable indication of leakage. Special attention should be given to whether the parameter is easily detected in water and to the variability of the parameter in background water. If background concentrations of a potential indicator parameter are sufficiently high or exhibit a high degree of variability, the arrival of low or moderate concentrations of leachate may be masked.

The list of parameters finally selected should be representative of constituents at least as mobile as the most mobile hazardous constituent reasonably expected to be derived from the facility's waste. Concentrating on the most mobile constituents will ensure that the arrival of leachate is detected at the earliest possible time.

In addition to indicator parameters, enforcement officials should consider having the facility sample for additional parameters that characterize the general quality of water at the site (e.g., Cl^-, Fe, Mn, Na^+, SO_4, Ca^+, Mg^+, K^+, NO^{-3}, $PO_4^=$, silicate, ammonium, alkalinity or acidity). Baseline data on the inorganic chemical composition of ground water can provide an important basis for comparison and planning should the program enter the assessment phase. Information on the major anions and cations that make up the bulk of dissolved solids in water, for example, can be used to determine reactivity and solubility of hazardous constituents and therefore predict their mobility under actual site conditions.

5.4.3 Fulfillment of Applicable Part 270 Requirements

When designing the remedy, enforcement officials should include elements that address the facility's information obligations pursuant to Part 270. If contamination is confirmed, the facility must generate the remainder of the information required by §270.14(c)(4), namely the extent of migration of any plume and the concentration of all Part 261 Appendix VIII constituents present in the plume.

Enforcement officials should also ensure that the remedy includes the collection of background data on all Appendix VIII constituents detected in

ground water. For many constituents, these data will be necessary to establish concentration limits for incorporation into the facilty's ground-water protection standard. As described in section 3.2.1, the permit writer will have to set concentration limits based on the mean of pooled data available at the time of permitting (unless there is a high temporal correlation between contaminant concentrations in upgradient and downgradient wells in which case concentration limits may be established through sampling at the compliance point). Therefore, it is in the best interests of both the facility and the Agency to have sufficient data available at the time of permitting to accurately characterize the quality of the background water at the site.

To guarantee sufficient data, enforcement officials should consider incorporating in the facility's prescribed remedy an accelerated program of background sampling for Appendix VIII constituents. The frequency of sampling should be dictated by the needs of the statistical test proposed by the facility for use in compliance monitoring. The sampling schedule should also consider the need for establishing seasonal and spatial variation in contaminant levels if such variation is expected at the site. Sections 6.3 and 7.3.2 of the Permit Writer's Guidance Manual provide further guidance on these points.

In addition, the order should require the submittal of the various plans and feasibilty studies necessary to establish a compliance monitoring program or a program for corrective action pursuant to §§270.14(c)(7) or (8) (see Section 2.3.2). By placing these permit application requirements on an enforceable compliance schedule, enforcement officials can help ensure that the requirements will be fulfilled in a timely manner.

5.5 Application of Enforcement Authorities to the Remedy

Once the enforcement staff and permit writer devise an appropriate remedy, the enforcement staff must determine the order and regulatory authorities best suited to compel the desired actions. As Section 4.2 on selecting order authorities points out, there are a variety of factors enforcement officials must consider when developing an enforcement strategy.

When deciding between order authorities, officials must first establish the applicability of the order to the situation at hand (i.e., does the situation meet the conditions necessary for the issuance of a particular order). Next, the official must consider whether the order can compel all aspects of the desired remedy. Where possible, it is advantageous to secure the entire remedy through a single authority in order to save resources and avoid the possibility of different appeal procedures. Finally, enforcement officials must factor in other relevant concerns such as the facility's compliance history and whether or not it is important in the instant case to assess a penalty. In certain circumstances, features such as the ability to assess a penalty may become the deciding factor when choosing between order authorities.

This section will apply the above principles to the model remedy developed in this chapter. It will outline a preferred enforcement strategy for the model remedy and will note where changes in the remedy could suggest needed changes in the proposed strategy. Table 5.5 at the end of the chapter, summarizes various enforcement strategies for facilities with different ground-water violations and different technical remedies.

5.5.1 Selection of the Order Authority

Assume that the only information known about the Scenario 2 facility is that presented in Figure 5.1; namely, the facility is in violation of the Part 265 ground-water regulations for the following reasons:

1. the facility located its wells based on a poor understanding of the site's hydrogeology;
2. there are too few wells installed; and
3. the owner cannot demonstrate that existing wells were properly constructed.

In addition, the facility is in violation of §270.14(c)(4) because the owner made no attempt to look for and assess any plume beneath the facility before the facility's Part B due date passed.

Based on the above information alone, the most appropriate order authority for compelling the model remedy of this chapter would be a §3008(a) order enforcing Parts 265 and 270. A §3008(a) order is the authority of choice for three reasons. First, the condition for issuing a §3008(a) order has already been mat - the facility is clearly in violation of the regulations. To use either of the other authorities, the Agency may have to expend additional resources to collect evidence that there may be a substantial hazard to public health or the environment [§3013] or a release of hazardous waste or constituents into the environment [§3008(h)].

Second, as the following section will explain, the entire remedy can be compelled using a §3008(a) order citing relevant sections of Parts 265 and 270. The remedy as presently conceived focuses exclusively on evaluating

the impact of the facility on ground water; hence, an order that can address other media, such as a 3013 or 3008(h) order, is not needed. Further, in this particular case, there is no reason to suspect that the threat posed by potential ground-water contamination is so compelling as to require corrective action prior to permitting. Therefore, it is not essential to use an order that can accommodate clean up of ground water during interim status. Of course, if additional evidence collected during plume characterization indicated that clean up should be pursued immediately, a §3008(h) order could be issued subsequent to the initial §3008(a) action.

Finally, a §3008(a) order has the added advantage that it can be used to assess penalties. Given that the facility has been out of compliance for the entire history of the program, the Agency should exercise its authority to assess penalties for past and continuing violations including the recovery of the facility's economic benefit of non-compliance.

Of course, if the starting scenario were different, the considerations guiding the selection of an order authority could change significantly. For example, if there were evidence of off-site contamination (e.g., a fish kill in a nearby stream) and the facility were known to delay resolution of proceedings by exercising every opportunity for appeal, enforcement officials may decide to postpone the assessment of penalties and immediately issue an order under §3013, §7003 or CERCLA §106 to avoid the time delay afforded by the administrative process. In another case, if a facility were out of compliance with the ground-water regulations and had significant soil contamination, the Region could use a §3008(h) order to achieve both compliance with

the regulations and clean-up of contaminated soil. The proper way to balance the advantages and disadvantages of each order authority can only be determine in the context of a particular situation.

5.5.2 Securing the Model Remedy Through a §3008(a) Order

As outlined in Figure 5.4, the model remedy derives directly from the regulations. Sections from Part 265 and 270 may be cited to compel additional hydrogeologic investigation and the installation of an adequate well network. Section 270.14(c)(4) may be cited to force sampling for an expanded list of parameters and to justify the comparison of upgradient and downgradient wells based on accelerated sampling. Finally, relevant sections of the Part 270 regulations may be cited to require the collection of background data on Appendix VIII constituents and the submission of other plans and data necessary for permitting.

Figure 5.4

MODEL REMEDY	REGULATORY CITES
1. Fill in gaps in the current understanding of the site's hydrogeology	§265.90(a) §265.91 §270.14(c)(2)
2. Install a monitoring network (or expand an existing system) to meet the objectives of a Part 265/264 detection system	§265.91
3. Sample for an expanded list of indicator parameters:	
Part 265 indicator parameters (TOX, TOC, pH, specific conductance)	§265.92(b)(3)

Figure 5.4 (continued)

Part 265 water quality parameters (Cl, Fe, Mn, Na, Phenols, Sulfate)	§265.92(b)(2)
Substances with National Interim Drinking Water Standards (Appendix III, Part 265)	§265.92(b)(1)
Appendix VIII of Part 261	§270.14(c)(4)
4. Determine whether contamination has occurred based on a comparison of data collected from up- and downgradient wells over a short period of time.	§270.14(c)(4)
5. If contamination is confirmed, begin assessing the plume based on monitoring of Appendix VIII constituents	§270.14(c)(4)
6. Sample to establish background for all Appendix VIII constituents detected in ground water	§270.14(c)(7)(iv)
7. Submit data and plans required for either compliance monitoring or corrective action	§270.14(c)(7) or (8)

The regulatory cites in this strategy are relatively straight forward; however, the role of §270.14(c)(4) deserves attention. As section 2.3.1 explains, the Agency may require a facility to look for and assess a plume at any facility where the owner/operator's program of interim status monitoring has detected a plume or has failed to establish definitively whether or not a plume exists.

Under §270.14(c)(4), the facility is obligated to assess the extent of any plume and sample for the full complement of Appendix VIII constituents.

Therefore, it is within the Agency's authority to require the facility to begin assessment and full Appendix VIII sampling immediately. The model technical remedy, however, limits the scope of sampling to a more manageable list of indicator parameters until the presence of a plume is confirmed or refuted. In effect, the model technical remedy refrains from immediately exercising the full power of §270.14(c)(4) in order to avoid wasted effort if indeed the facility has not leaked.

5.6 Variations on the Model Scenario

This chapter has used the facility described in scenario 2 to illustrate some of the principles enforcement officials should consider when designing technical remedies and developing enforcement strategies. As the scenario changes, the remedy appropriate for the situation and the enforcement tools available to secure that remedy change as well. Figure 5.5 (at the end of the chapter) illustrates how the technical remedy and enforcement response vary based on the status of the facility at the time of enforcement review.

It is important to note that all proposed remedies include correcting any deficiencies in the existing detection network even if the facility has already detected contamination and begun to characterize the plume. As described in the Chapter 2, a sound well network at the limit of the waste management area is critical to every phase of ground-water monitoring, from interim status monitoring to compliance and/or corrective action monitoring. Therefore, it makes sense to correct any deficiencies in the interim status detection system, because these wells will be used throughout the life of the facility. Moreover, a system may have detected a plume in one area and still be incapable

of detecting a plume at some other point. In such cases, the system should be upgraded so that it will be capable of detecting future plumes of contamination.

It is further important to note that where a facility has managed to detect a statistically significant change in indicator parameters even though its detection system is inadequate (see Scenario 2 in Figure 5.5), enforcement officials should require the facility to begin characterizing the plume downgradient from the triggering well and at the same time perform additional hydrogeologic evaluation and upgrade the detection network.

Finally, the technical remedies outlined in this chapter are appropriate not only for operating units but also for most units that are closed or are planning to close. Section 270.1(c) states that units closing after January 26, 1983 must have permits during the post-closure period.[13] For units that accepted hazardous waste after July 26, 1982, the post-closure permit would include the ground-water monitoring program set out in Part 264 and the permit application would include the ground-water monitoring data required under §270.14(c). Thus, once a closing unit's Part B application is due, enforcement officials can rely on the same range of enforcement options that are available to address operating units.

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13 In order to implement §3005(i) of the Solid Waste Disposal Act, as amended, the Agency intends to propose amending §270.1(c) to make all units closing after July 26, 1982 subject to post-closure permits. Section 3005(i) of the revised Act makes all units receiving wastes after 7/26/82 subject to Part 264 ground-water monitoring and corrective action requirements. Since a permit is the means by which the Agency implements the Part 264 standards, the Agency considers it necessary to revise §270.1(c) in order to make all units subject to Part 264 ground-water monitoring and corrective action also subject to post closure permitting.

There are three categories of units that would not currently be subject to the Part 265/270 program outlined in this chapter. First, units that closed before January 26, 1983 are not required to obtain permits and thus are not subject to Part 270 requirements [codification rule may roll this date back to July 26, 1982]. Second, units that ceased receiving hazardous waste by July 26, 1982 are not subject to the Part 264 ground-water monitoring provisions and therefore, in applying for the permit, would not need to include the ground-water data required under §270.14(c)(4). Third, no post-closure requirements apply, and thus no permit or permit application is currently required for a surface impoundment or waste pile that closes by removing all hazardous waste and waste residues from the unit, the underlying and surrounding soil, and the ground water. The Agency is presently evaluating whether §3005(i) may require the Agency to make units that clean closed under Part 265 but received waste after 7/26/82 subject to post-closure permitting in order to implement Part 264 ground-water monitoring and corrective action.

In all of the above cases, however, the Part 265 ground-water monitoring requirements do apply and should be enforced.[14] In the case of a surface impoundment closing through removal, the Agency/State should ensure that the

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[14] The successful execution of closure responsibilities (e.g., installation of a cap, run-off and run-on control) does not absolve a facility from its Part 265 ground-water monitoring responsibilities. Section 265.117 of the regulations states that closed facilities must comply with the ground-water monitoring and reporting requirements of Subpart F for 30 years after the date of closure. Therefore to meet its post-closure care requirements, a closed or closing facility with an inadequate Part 265 monitoring network would have to upgrade its system and assess any plume of contamination detected during the post-closure care period.

closure plan provides for monitoring that is adequate to demonstrate the absence of hazardous waste in the ground water. Surface impoundments generally cannot qualify for closure by removal if any hazardous waste is present in the ground water; such impoundments must instead close as land disposal facilities.

FIGURE 5.5 VARIATIONS ON MODEL REMEDY AND ENFORCEMENT RESPONSE

FACILITY STATUS	EXAMPLE SCENARIOS	PROPOSED REMEDY	ADMINISTRATIVE ENFORCEMENT OPTIONS
1. *No* statistically significant increase in indicator parameters under Part 265 detection. Adequate hydrogeologic assessment and construction of wells. Site conditions or additional evidence suggest that leakage may have occurred.	a) Unlined lagoon contains a large volume of lead-containing wastes. High variability in background measure of specific conductance may have masked escape of lead into ground water. Subsurface is naturally acidic. Shallowness of water table and lack of liner suggest high probability of leakage.	1. Develop list of meaningful indicator parameters. 2. Sample upgradient and downgradient wells for indicators. 3. If there is a statistically significant difference between up- and downgradient wells, assess plume to determine extent of migration and concentration of all Appendix VIII constituents (new wells may be required). 4. Establish background values for all Appendix VIII constituents found in plume. 5. Develop compliance monitoring or corrective action program as appropriate	1. §3013 if substantial present or potential threat to public health or environment exists; or 2. §3008(h) if there is evidence of release of hazardous waste or constituents into the environment.
	b) Surface impoundment with synthetic liner. Wells placed at 60 ft. centers. Uniform glacial till with permeability of 10^{-5}. Nearby pond downgradient from facility is contaminated with TCE. Waste in surface impoundment is known to contain TCE. Agency suspects that there is ribbon plume escaping from leak in liner.	1. Install additional wells in area(s) of highest probability of leakage taking into account hydrogeology of site and facility design (e.g., near liner seams). Note: computer modeling may help estimate source of plume. 2. Proceed as in 1(a) above.	1. §3013 if substantial present or potential threat to public health or environment exists; or 2. §3008(h) if there is evidence of release of hazardous waste or constituents into the environment.

FIGURE 5.5 (continued)

FACILITY STATUS	EXAMPLE SCENARIOS	PROPOSED REMEDY	ADMINISTRATIVE ENFORCEMENT OPTIONS
2. Statistically significant increase in Part 265 indicator parameters. Inadequate Part 265 detection system. Inadequate Part 265 assessment.	a) Facility located wells based on regional hydrogeologic information only. Facility has only five wells in place, one considered upgradient and four considered downgradient spaced at 400 ft. centers. Facility has no drilling logs or construction specs on wells. Despite inadequacy of system, statistically significant increase in TOC detected.	1. Fill in gaps in hydrogeological assessment. 2. Based on results, install new (or expand and improve) existing detection network. 3. *Concurrently* with above, have facility submit plume characterization plan to determine extent of plume & concentration of Appendix VIII constituents present. 4. Assess plume and establish background values for all Appendix VIII constituents detected; 5. Develop compliance monitoring and/or corrective action program as appropriate.	1. §3008(a) enforcing Parts 265 and 270; 2. §3013 if substantial present or potential threat to public health or environment exists; or 3. §3008(h) if there is evidence of a release of hazardous waste or constituents into the environment.
3. Adequate detection monitoring system in place. Statistically significant increase in Part 265 indicator parameters. Inadequate Part 265 assessment monitoring program; therefore inadequate permit application.	a) Owner/operator performed adequate hydrogeologic assessment and provided drilling logs and well design specs to substantiate the adequacy of his detection network. However, the owner/operator used only ground-penetrating radar to define boundaries of plume and established rates of migration using unrealistic assumptions.	1. Have facility submit assessment plan to determine extent of plume and concentration of all Appendix VIII constituents. 2. Assess plume and establish background values for Appendix VIII constituents detected. 3. Develop compliance monitoring and/or corrective action program as appropriate.	1. §3008(a) enforcing Part 270. 2. §3013 if substantial present or potential threat to public health or environment exists; or 3. §3008(h) if there is evidence of a release of hazardous waste or constituents into the environment.

FIGURE 5.5 (continued)

FACILITY STATUS	EXAMPLE SCENARIOS	PROPOSED REMEDY	ADMINISTRATIVE ENFORCEMENT OPTIONS
4. Same as in #3, but Part 265 assessment program properly carried out. Inadequate permit application.	a) Large amounts of K006 waste disposed at site. Sampling for relevant Appendix VII constituent, hexavalent chromium, did not confirm contamination. Owner/operator applied for detection monitoring permit claiming false trigger. Facility did not sample for other organic constituents known to be in K006 waste and listed in Appendix VIII as required by §270.14(c)(4).*	1. Assess plume for all Appendix VIII constituents (can probably use same wells used for Part 265 assessment). 2. Establish background values for all Appendix VIII constituents found in plume. 3. Have owner/operator apply for compliance monitoring and/or corrective action permit as appropriate.	1. §3008(a) enforcing Part 270; 2. §3013 if substantial present or potential threat to public health or environment exists; or 3. §3008(h) if there is evidence of hazardous waste or constituents into the environment.

*K006 waste (wastewater treatment sludge from the production of chrome oxide green pigments-anhydrous and hydrated) was listed because it contains hexavalent chromium i.e., the only Appendix VII constituent related to K006 is Cr^{+6}. K006 waste, however, contains a host of organic solvents. Therefore, the owner/operator could have fulfilled his Part 265 assessment monitoring obligations by monitoring for Cr^{+6}. To fulfil his obligations under §270.14(c)(4), however, the owner/operator would have to expand his sampling and analysis program to include the organics on Appendix

FIGURE 5.5 (continued)

FACILITY STATUS	EXAMPLE SCENARIOS	PROPOSED REMEDY	ADMINISTRATIVE ENFORCEMENT OPTIONS
5. Inadequate Part 265 detection system. No statistically significant increase in parameters. Owner/operator notifies Agency that (s)he intends to close. Closure plan does not address potential ground-water problems.	a) Land disposal facility announces intent to close after submitting a highly inadequate Part B application and receiving NOD that details work to be done before application can be considered complete.	1. Have facility pursue model remedy that is outlined in Chapter 5. Closing land disposal facility has same Part 270 and Part 264 ground-water monitoring obligations (pursuant to post-closure permit) as facility applying for operating permit. 2. Pursue corrective action if warranted.	1. §3008(a) enforcing Parts 265 and 270. 2. §3008(h) if there is evidence of a release of hazardous waste or constituents into the environment.
	b) Facility submits closure plan in lieu of Part B operating or post-closure permit.	1. Call in facility's post-closure permit if not already due. 2. Where possible, enter into consent agreement that outlines steps owner/operator must take to generate adequate post-closure permit application. 3. Where agreement is not possible, issue order enforcing Part 265 that compels hydrogeologic investigation and well installation. 4. Once application due date has passed, amend complaint and have o/o proceed with aspects of model remedy that rely on authority of Part 270.	1. §3008(a) enforcing Parts 265 and 270. 2. §3008(h) if there is evidence of a release of hazardous waste or constituents into the environment.

CHAPTER 6

DEVELOPING ORDERS

The purpose of this chapter is to help enforcement officials ensure that the ground-water remedy sought by the Agency is in fact executed by the respondent. The chapter will discuss the importance of specificity in detailing the desired remedy and various strategies that may be followed in developing and issuing orders. The chapter will concentrate exclusively on how to develop the technical content of compliance orders; it will not address legal issues related to writing orders or issuing complaints. Guidance on such issues is already available in the Compliance/Enforcement Guidance Manual dated September, 1984 (See especially Chapter 7, "Administrative Actions: Civil").

6.1 Importance of Specificity

The Agency's experience to date suggests that certain members of the regulated community have failed to implement a ground-water system capable of meeting the requirements of Parts 265 and 270. This is particularly true with respect to Part 265's broad performance standards and may increase with respect to Part 270 as Part B applications are filed. As Section 4.1.2 points out, even though the regulations do not specify in detail how a system should be designed and operated, the performance language demands a rigorous program of hydrogeologic investigation, network design, well construction, and sampling and analysis.

Despite the high standards set by the regulations, certain owner/operators have ignored this performance language and have installed only four wells (three downgradient and one upgradient), in settings whose complex hydrogeology require a substantially greater number of wells.

In light of the failure of certain facilities to achieve the high standards set by the regulations, it is essential that the Agency introduce specificity into the administrative enforcement process. In the course of each administrative proceeding there must develop between the Agency and the respondent an express understanding as to what activities will constitute compliance with the regulations. Administative orders that are explicit regarding the Agency's expectations can help ensure that the actions taken by the owner/operator will be sufficient to bring the facility into compliance. Specificity regarding what will be considered appropriate or adequate, can help avoid the wasted time and effort that results when a respondent performs actions later deemed inadequate. It is clearly in the best interest of both parties to ensure that the facility's first effort to come into compliance meets the Agency's requirements.

The Agency can secure this assurance either by reviewing the owner/operator's plans for coming into compliance before the work is actually performed or by specifying up front exactly what actions are required of the respondent. An order, therefore, can be structured in one of two ways. If issued prospectively, an order may be structured around the submittal, and subsequent Agency review, of individual plans outlining the respondent's proposed actions for implementing each phase (hereafter referred to as a

"phased order"). Alternately, the Agency can issue highly explicit orders that define technically what the owner/operator must do to come into compliance.

The next two sections of this document explain the above two types of order in greater detail. Both orders place the burden of system design on the respondent, yet provide the Agency with an opportunity to veto any design before the system is actually implemented. When issuing either type of order, enforcement officials must make clear that notwithstanding compliance with the order, the respondent remains responsible for compliance and abatement of any ground-water contamination. A specific provision should be included in all orders noting that the respondent may be required to take further actions as necessary to comply with RCRA or other applicable laws.

6.2 Phased Orders for Ground-Water Monitoring Violations

The concept of phased orders is relatively new to the RCRA program. As its name implies, a phased order lays out a series of actions the respondent must take over time in order to come into compliance. Each action or phase is linked to an enforceable compliance schedule and generally includes some mandatory interaction between the respondent and the Agency. Most commonly, each phase will include the development of a plan by the respondent to accomplish a specified goal; the submittal of the plan to the Agency for review, modification, or approval; and the eventual execution of the plan by the facility owner.

A phased order format is especially well suited for addressing ground-water monitoring violations at hazardous waste facilities. In many ground-

water cases, the nature of the violation is such that neither the facility nor the Agency knows at the outset exactly what actions will be necessary and sufficient to bring a facility into compliance. Many ground-water violations, for example, derive directly from a facility's lack of understanding of the hydrogeology beneath their site. As more information is collected and interpreted, the steps appropriate for a respondent to take may change. Developing a technical remedy under such circumstances is, of necessity, a dynamic process.

A phased order, however, can accomodate these changes. By proceeding in stages, a phased order allows the Agency to structure and guide a facility's actions without locking the facility or the Agency into a specific remedy that may prove inadequate. Moreover, the order provides a mechanism for the Agency to communicate more specifically EPA's expectations regarding various aspects of the owner/operator's response. For example, the Agency can set out in the order the information a hydrogeologic assessment must yield in order to provide the level of detailed understanding the Agency considers necessary for the installation of an adequate ground-water monitoring system. Where the Agency has specific preferences on how certain types of information should be obtained (e.g., a preference for specific tests or procedures), enforcement officials can specify the use of the test in the order. Alternately, an order may list objectives or considerations that an owner/operator must incorporate into his/her decision-making. The order might specify, for example, that the owner/operator must demonstrate in the plan that a proposed sampling device: 1) minimizes the potential for degassing; and 2) minimizes the potential for adsorption and desorption of constituents.

Appendix A includes a sample order that illustrates some of the above options. This order is structured around the needs of the "transition facility" described in Chapter 5; recall that this facility has an inadequate detection monitoring system and has not detected a significant change in the Part 265 indicator parameters. The preferred technical and enforcement response for such a facility is summarized below.

Action on the Part of Facility Owner	Enforcement Authority
1) Conduct detailed assessment of site's hydrogeology (fill in gaps in current understanding of site's subsurface).	1. §265.91(a) §270.14(c)(2)
2) Install a monitoring network (modify/expand an existing system) to meet the objectives of 265/264 detection.	2. §265.91
3) Sample for an expanded list of indicator parameters.	3. §270.14(c)(4)
4) Determine whether contamination has occurred by comparing upgradient and downgradient well samples collected on an accelerated schedule.	•
5) If contamination is confirmed, begin characterizing the plume based on monitoring of Appendix VIII constituents.	•

To implement this remedy, the sample order in Appendix A mandates the execution of six tasks:

1) Submittal of a plan to conduct a hydrogeologic assessment of the site;

2) Submittal of a list of constituents or parameters to be monitored for (Note: sampling protocol and well construction materials will be dictated by chosen indicator parameters);

3) Submittal of proposed monitoring network, including well locations, screening depths, construction methods, and design specifications (e.g., filter pack material, slot size, well diameter);

4) Submittal of a sampling and analysis plan;

5) Execution of the plans developed in steps 1, 3, and 4 (following Agency approval);

6) If contamination is confirmed, submittal of a plan outlining proposed assessment activities.

The order combines these tasks into three phases and establishes compliance deadlines for each phase. For example, the order requires the owner/operator to develop and submit the hydrogeologic assessment plan and the list of parameters by the same date (phase 1). Next, the order instructs the respondent to complete the assessment and submit the results of the investigation along with a monitoring network plan and a sampling and analysis plan by the next compliance date (phase 2). After EPA approves or modifies these plans, the order requires the respondent to make the first determination of contamination and submit the results and an assessment plan (if contamination is confirmed) by the final date (phase 3).

The sample order combines the required tasks in the above manner for the purpose of illustration only. In every case, the logical sequence of events will be dictated by the particulars of the site. Enforcement officials must use professional judgement when deciding which tasks are appropriate, how they should be combined, and what level of Agency/facility interaction the order should mandate.

6.3 Technically Specific Orders

Rather than structure the development of the technical remedy through the order itself, enforcement officials may prefer to oversee the collection of background data and the development of a proposed remedy through informal interaction and negotiations with the facility. This approach is acceptable

as long as the work done in preparation of the remedy (e.g., hydrogeologic assessment activities), and the final terms of the remedy itself (e.g., well locations, sampling schedules), are set out in a technically-specific order (usually on consent). The order may be issued before the wells are installed and the sampling conducted, or it may be issued afterwards. If negotiations become protracted and work is not proceeding expeditiously, however, the Region should issue the order and place the facility on an enforceable compliance schedule.

Whether the work is conducted before the order is issued or after, detail in the order regarding completed and proposed work will help avoid future questions of compliance with the order. The greater the specificity in the order, the easier it will be for the Agency or a court to determine whether the terms of the agreement have been met.

Enforcement officials should not underestimate the level of detail that can be incorporated into orders. Well design specifications, decontamination procedures, and sampling frequencies are all suitable for specification. In addition, enforcement officials should consider specifying certain behaviors or actions on the part of the respondent. For example, officials may wish to require that a qualified geologist be present to take field notes (e.g. drilling logs and boring logs) during all well installations and soil boring programs.

No requirement is inappropriate if it is directly related to the ability of the owner/operator to meet his regulatory obligations. Table 6.1 summarizes some of the items enforcement officials may wish to consider when developing orders.

Table 6.1 Possible Elements of a Technically-Specific Order

HYDROGEOLOGIC ASSESSMENT

Boring Program

- Spacing of boreholes
- Depth and location of boreholes
- Vertical spacing of samples within each borehole
- Sampling equipment to be used for boring program
- Information to be logged for each borehole
- Requirement that hydrogeologist or geotechnical engineer be present to log boreholes
- Method for stabilizing selected boreholes until wells are installed
- Method of data presentation
- Requirement to use Unified Soil Classification System (USCS), Atterberg limits

Water Level Monitoring Program

- Spacing/number of piezometers or wells
- Method for water level measurements
- Required precision of measurement (to the nearest 0.1 foot or to the nearest centimeter)
- Requirement that measuring points be surveyed from established benchmar
- Number of hydrogeologic cross sections and appropriate scale
- Water level contour maps
- Identification of local sources of ground-water withdrawal and recharge and approximate schedule of use

Hydraulic Conductivities

- Method of determining hydraulic conductivities, porosity

Additional Information Requirements

- Description of regional geologic and hydrogeologic characteristics
- Analysis of geomorphic or topographic features that might influence ground-water flow system
- Zones of higher or lower permeability that might direct or restrict flow of contaminents
- Zones of significant fracturing or channeling in consolidated deposits
- Sand or gravel deposits in unconsolidated deposits
- Description of manmade hydraulic structures (pipelines, french drains, ditches, etc.)
- Soil properties including cation exchange capacity, organic content temperature profile, grain size distribution

Additional Information (continued)

- o Identification of zones of recharge and discharge
- o Interpretation of hydraulic interconnections between saturated zones

NETWORK DESIGN

Placement of Wells

- o Maximum horizontal spacings
- o Requirement for well clusters
- o Depth requirements (most in surficial aquifer, one or more in deeper aquifer
- o Exact well locations
- o Minimum number of background wells

Well Design and Construction

- o Casing material and diameter; prohibition against joining section with glues or sealants
- o Screen slot size and maximum length
- o Drilling techniques; prohibition on use of drilling muds
- o Drill decontamination procedures
- o Well development techniques; prohibition on use of water other than formation water or "certified" pure water
- o Filter pack material and method of filter-pack emplacement
- o Method and material for sealing annular space
- o Requirement for locked well caps
- o Requirement that wells be designed to last at least 30 years
- o Requirement that wells yielding turbid samples be redeveloped or replaced
- o Information to be documented during construction of each well

SAMPLING AND ANALYSIS

Analytes of Interest

- o List of parameters to be monitored for
- o Requirement to collect data on major ions and anions, e.g., Cl^-, Fe, Mn, Na^+, Ca^+, Mg^+, NO_3^-, $PO_4^=$, silicate, ammonium, alkalinity, acidity.
- o Requirement for field monitoring of pH, conductivity, and temperature for each sample

Sample Collection

- o Evacuation procedures; handling procedures for evacuation water
- o Method for sampling "floaters" and "sinkers"

Sample Collection (continued)

- o Acceptable materials for inclusion in sampling devices and/or specific device to be used
- o Performance standard for sample collection - "sampling device and methodology must be selected to yield representative samples in light of the parameters that are being monitored"
- o Requirement that sampling devices be dedicated to each well or procedures for decontaminating equipment between wells
- o Precautions on use of specific sampling devices (e.g., bladder pumps must be operated in a continuous manner so that they do not produce pulsating samples that are aerated in the return tube upon discharge; check valves must be designed and inspected to ensure that fouling problems do not reduce delivery capabilities or result in aeration of sample, etc.)
- o Specification of acceptable cords/cables to be used to lower bailers; prohibitions on use of braided cables, polyethylene or nylon cords
- o Maximum sampling rates, generally not to exceed 100 milliliters/minute

SAMPLING PRESERVATION AND HANDLING

- o Designation of appropriate sample containers - polyethylene containers with polypropylene caps when metals are analytes of interest; glass containers when organics are analytes of interest
- o Requirement to use preservation methods designated in SW-846
- o Preferred handling procedures e.g., volatile organics: no filtering or headspace in containers allowed; metals: two aliquots from each sample - one filtered and analyzed for dissolved metals, and one not-filtered and analyzed for total recoverable metals

ANALYSIS

- o Requirement for use of field blanks, standards, and spiked samples for QA/QC
- o Requirement to use analytical methods described in SW-846
- o Requirement to perform field analysis of pH, conductivity, and temperature

CHAIN OF CUSTODY

- o Minimum requirements for chain-of-custody program (e.g., sample labels, seals field log book, chain of custody record, sample analysis request sheet, laboratory log book)

DATA REVIEW AND PRESENTATION

- o Standard protocol for reporting of less than detection limit concentrations
- o Requirement that data values for each pollutant be reported using the number of significant digits, in general at least three

DATA REVIEW AND PRESENTATION (continued)

- Requirement that units of measure for a given chemical parameter be consistent throughout report and accompany each chemical named
- Requirement that raw data be submitted in a table that lists for each concentration value: the pollutant, the well code, and the unit of measure
- Requirement that owner/operator compile the following ten statistics for each of four summary tables organized by pollutant; by pollutant-well; by pollutant-date; and by pollutant-well-date:
    - Number of lower than detection limit values
    - Total number of values
    - Mean
    - Median
    - Variance
    - Standard Variation
    - Coefficient of variation
    - Range
    - Minimum value
    - Maximum value

ADDITIONAL PLUME CHARACTERIZATION ACTIVITIES

- Requirement to use certain remote sensing (e.g., aerial photography) and geophysical techniques (e.g., electrical resistivity, ground-penetrating radar, borehole geophysics)
- Requirement to determine the physical and chemical characteristics of the facility's leachate including density, solubility, vapor pressure, viscosity, and octanol-water partition coefficient

PERMIT APPLICATION REQUIREMENTS

- Requirement to collect background data on all Appendix VIII constituents detected in ground water
- Requirement to submit applicable data, studies, and plans detailed in §270.14(c)(1) - (8)

OTHER PROVISIONS

- Schedule for implementation including stipulated penalties for missed milestones
- Penalties for past and present violations
- Procedures for plan submittal, modification, and/or approval
- Provision that incorporates all plans, reports, and schedules required by the ORDER into the ORDER itself such that any non-compliance with a plan, report or schedule consitutes non-compliance with the order

OTHER PROVISIONS (continued)

- Clause that reserves government's right to take further action as necessary, including additional ground-water monitoring and/or cleanup, to bring respondent into compliance with RCRA other applicable State or Federal law
- Requirement to develop and implement a community relations plan
- Requirement to develop and implement a health and safety plan for workers involved with monitoring or corrective action
- Requirement to designate corporate contact person, supply corporate organizational charts, and provide background information and qualifications of any contractors used to meet the terms of the ORDER
- Clause guaranteeing site access for employees, agents or contractors of complainant to inspect and evaluate compliance with ORDER pursuant to authority in §3007 of RCRA 42 USC §6927
- Requirement to develop Quality Assurance Project Plan in accordance with EPA guidance document QAMS - 005/80.
- EPA idemnification clause
- Clause guaranteeing EPA's right to take or split samples
- Clause establishing EPA's ability to halt work if necessary
- Effective date
- Signature

6.4 §3008(a) Orders

The §3008(a) process can accomodate the issuance of either phased or technically-specific orders. In fact, a single order may incorporate both approaches.

The process of issuing a §3008(a) order is diagrammed in Appendix B. Briefly, the process involves the issuance of a complaint and compliance order followed by negotiations (if desired by both parties), a hearing (if requested by the respondent) and the issuance of a consent order or a final unilateral order. If a respondent does not answer the complaint, (s)he become subject to a default order. Generally, a respondent answers the complaint, requests a hearing, and then either enters into a consent agreement with the Agency or proceeds through the hearing and becomes subject to a final order issued unilaterally.

If the Agency feels confident that a particular respondent will not default, the compliance order issued with the complaint may include a broadly-stated remedy such as "compliance with Part 265 Subpart F and Part 270." Since the respondent is required to undertake remedial activities and/or pay any assessed penalty only after the consent order or final order is issued, it is only in the consent or final order that specificity becomes critical. Some Regions seem to prefer compliance orders with broadly-stated remedies, although developing a phased compliance order, which would require the respondent to develop detailed plans, should prove to be fairly simple in most cases.

The Regions should try to avoid the situation where a broadly-stated compliance order is issued with the complaint, the respondent fails to answer, and a default order is issued. In this case the terms of the compliance order may become the terms of the default order. Although respondents do not usually fail to answer complaints, especially when sizeable penalties are involved, the Region should consider the possibility of a respondent failing to answer, before deciding on a format for the compliance order.

The following describes in more detail the options available under §3008(a):

OPTION (1): The Region may issue a complaint with a phased compliance order, enter negotiations with the respondent and then follow one of several courses of action, depending on whether a settlement is reached with the respondent. If both parties are willing to settle and can reach agreement on the remedy, a consent order may be negotiated in either a phased or a technically-specific format, depending on how detailed the discussions have been in negotiating sessions. If in the course of negotiations the facility has filled in any gaps in the hydrogeologic study and the Region and respondent have agreed on such details as the list of indicator parameters and the location of wells, a consent order could be negotiated that specifies the location of wells, construction specifications, etc. The order might also specify sampling and analytical procedures and schedules, or it might require the respondent to develop and submit a plan for sampling and analysis. As noted in section 5.2, the Region might choose to enter into a consent agreement only after completion of the remedial activities by the respondent. In such

cases, the consent order should document, in detail, the work that has been completed by the respondent.

If the parties are unable to reach settlement and a hearing takes place, the Region will have the opportunity to submit a proposed final order to the Presiding Officer. The proposed final order may be phased or may be technically specific, depending on the amount of information available to the Region. In any case, the proposed order should not simply include a broad mandate, like "the owner/operator must come into compliance with Part 265 Subpart F and Part 270." It should either specify a detailed remedy itself or should require the owner/operator to develop a plan that specifies details. Unless it is clear to both parties what the order requires, it will be difficult to determine whether the facility in fact achieves compliance. If there is room for dispute as to what the order requires, it may be difficult for the Agency to enforce the terms of the order, should that later become necessary.

OPTION (2): The Region may issue a complaint with a proposed compliance order that simply requires "compliance with Part 265 Subpart F and Part 270" rather than a phased compliance order. The steps following complaint issuance would be the same as those described in Option 1. Although it is acceptable to put a broad remedy in the initial compliance order, the consent order or proposed final order must contain specificity (or require the respondent to propose the specifics). When the order goes into effect it must express what "compliance" entails. As described earlier, the Region should not use a vaguely-worded compliance order if there is a chance that the respondent will not answer the complaint.

6.5 §3013 Orders

Section 3013 orders can be issued in either a one- or two-step process. Both processes are adaptable to the issuance of either phased or specific orders. The one-step process involves one of the following:

- o issuance of a phased order requiring the sequential development, submittal, and execution of plans; or
- o issuance of a technically-specific order, after the details are worked out in negotiations with the respondent.

The two-step process involves the issuance of a preliminary order requiring the development and submittal of plans for approval, followed by the issuance of an order requiring the execution of the plans as modified by the Agency. The second order could be phased or specific, depending on the amount of information available. For example, if the remedy sought by the Agency included a significant amount of hydrogeologic investigation as well as construction and sampling of wells, the preliminary order might require the development of a plan for the hydrogeologic study and a schedule for the development and implementation of plans for later stages of the remedy. The second order would then require the owner/operator to conduct the hydrogeologic work and then sequentially develop, submit, and carry out plans for well construction and sampling.

Alternatively, the preliminary order could require the development of well construction and sampling plans, which would entail conducting a hydrogeologic investigation. The second order then would be able to specify detail as to the locations and specifications of the wells and plans for sampling and analysis.

6.6 §3008(h) Orders

Section 3008(h) orders can accomodate both phased and specific orders in a manner similar to that described in section 6.4 for §3008(a) orders.

APPENDIX A:

MODEL PHASED ORDER FOR GROUND-WATER MONITORING

EXAMPLE PHASED ORDER

Pursuant to Section(s) _____ of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 69__ it is ordered that _____ shall comply with the following requirements:

1. Within __ calendar days of the effective date of this ORDER, respondent shall develop and submit for EPA approval a plan for conducting a hydrogeologic investigation of the site. The plan should be designed to provide the following information:

   a. A description of the regional geologic and hydrogeologic characteristics in the vicinity, including:

      1) regional stratigraphy: description of strata including strike and dip, identification of stratigraphic contacts, petrographic analysis

      2) structural geology: description of local and regional structural features (e.g., folding, faulting, tilting, jointing, etc)

      3) depositional history

      4) regional ground-water flow patterns

      5) identification and characterization of areas of recharge and discharge

   b. An analysis of any topographic features that might influence the ground-water flow system (Note that stereoscopic analysis of aerial photographs should aid in this analysis).

   c. A classification and description of the hydrogeologic properties of all the hydrogeologic units found at the site (i.e., the aquifers and any intervening saturated and unsaturated units), including:

      1) hydraulic conductivity, effective porosity

      2) lithology, grain size, sorting, degree of cementation

      3) an interpretation of hydraulic interconnections between saturated zones

d. Using a topographic map or aerial photograph as a base, submit maps of structural geology and at least four hydrogeologic cross sections showing the extent (depth, thickness, lateral extent) of all hydrogeologic units within the facility property, identifying:

1) sand and gravel deposits in unconsolidated deposits.

2) zones of fracturing or channeling in consolidated deposits

3) zones of higher permeability or lower permeability that might direct or restrict the flow of contaminants

4) perched aquifers

5) the uppermost aquifer (includes all water-bearing zones above the first confining layer that may serve as a pathway for contaminant migration including perched zones of saturation)

e. A description of water level or fluid pressure monitoring including:

1) water-level contour and/or potentiometric maps

2) hydrologic cross sections showing vertical gradients

3) an interpretation of the flow system, including the vertical and horizontal components of flow

4) an interpretation of any change in hydraulic gradients due, for instance, to tidal or seasonal influences

f. A desciption of manmade influences that may affect the hydrogeology of the site, identifying:

1) local water-supply and production wells with an approximate schedule of pumping

2) manmade hydraulic structures (pipelines, french drains, ditches)

The plan should include a description of the field methods and other information sources proposed for the study and a summary of which data will be collected by each method. The proposed methods should include, but are not limited to:

a. A program of soil borings, as required to adequately describe the subsurface geology of the site. The program should provide for the presence of a qualified geologist or geotechnical

engineer to log and describe the materials encountered during the boring. The program should also describe the methods proposed to stabilize selected holes until monitoring wells are installed.

b. A sufficient number of piezometers to characterize ground-water depth and gradient (both horizontal and vertical) over the entire area of the site.

c. The use of slug and/or pump tests as appropriate to determine hydraulic conductivities

NOTE: Geophysical techniques, both borehole and surficial, are effective supplementary investigative techniques that should be considered

The plan shall contain a schedule for conducting the proposed hydrogeologic assessment and shall be submitted to:

Deputy Director, Air and Waste Management Division
Environmental Protection Agency
444 RCRA Way
Anytown, USA 00001

2. Within ___ calendar days of the effective date of this ORDER, respondent shall develop and submit to EPA a list of proposed indicator parameters capable of detecting leakage of hazardous waste or hazardous constituents into ground water. The parameters should be representative of constituents at least as mobile as the most mobile constituents that could reasonably be derived from the facility's waste, and should be chosen after considering:

a. the types, quantities, and concentrations of constituents in wastes managed at the facility;

b. the mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;

c. the detectability of the indicator parameters, waste constituents or reaction products in ground water;

d. the concentration or value and the natural variation (known or suspected) of the proposed monitoring parameter in background ground water.

The list should include the basis for selecting each proposed indicator parameter, including any analyses or calculations performed. The basis for selection must include chemical analysis of the facility's waste and/or leachate as appropriate.

The list should also include parameters to characterize the site-specific chemistry of ground water at the site, including but not limited to the major anions and cations that make up the bulk of dissolved solids in water (i.e., Cl^-, Fe, Mn, Na^+, SO_4, Ca^+, Mg^+, K^+ NO^{-3}, $PO_4^=$, silicate, ammonium).

3. Within __ calendar days of written approval by EPA, the respondent shall promptly implement the hydrogeologic investigation plan according to the terms and schedules contained therein.

4. Within __ calendar days after completion of the hydrogeologic investigation, the respondent will submit to EPA a full report that provides the information described in paragraph 1.

5. Also within __ days after the completion of the hydrogeologic investigation, the respondent will submit to EPA a plan for the design and installation of a monitoring well network that will meet the following requirements:

   a. The upgradient wells must be capable of yielding samples that are representative of background water quality in the uppermost aquifer and are not affected by the facility. The number and location of the wells must be sufficient to: 1) characterize the spatial variability of background water; and 2) meet the needs of the statistical test proposed pursuant to paragraph __.

   b. The downgradient wells must be capable of immediately detecting any statistically significant amounts of hazardous waste or hazardous constituents that migrate from the facilty into the uppermost aquifer.

   c. The monitoring system should be designed to operate for a period of no less than thirty years.

   The plan should include the following elements:

   a. A description and map of proposed well locations, including a survey of each well's surface reference point and the elevation of its top of casing.

   b. Size and depth of wells;

   c. Desciption of well-intake design, including screen slot size and length; filter pack materials and method of filter-pack emplacement.

   d. Type of proposed well casing and screen materials. The choice of well materials should be made in light of the parameters to be monitored for and the nature of the leachate that could potentially migrate from the facility. The well materials should: 1) minimize the potential of adsorption and desorption of constituents from the samples; and 2) maintain their integrity for the expected life of the system (at least thirty years).

e. Methods used to seal the well from the surface and prevent downward migration of contaminants through the well annulus.

f. Description of the methods or procedures used to develop the wells.

6. Also within ___ days after the completion of the hydrogeologic assessment, the Respondent shall sumbit a sampling and analysis plan capable of yielding representative samples for a comparison of up- and downgradient wells. The plan should include the following elements:

a. Well evacuation procedures including volume to be evacuated prior to sampling and handling procedures for purged well water

b. Sample withdrawal techniques. Sampling equipment and materials (tubing, rope, pumps, etc.) shall be selected to yield representative samples in light of parameters to be monitored for. The sampling protocol will include field measurement of pH, conductivity, and temperature for each sample.

c. Sample handling and preservation techniques including provision for field-filtration of samples as appropriate.

d. Procedures for decontaminating sampling equipment between sampling events.

e. Procedures for measuring ground-water elevations at each sampling event

f. Chain of custody procedures to be used for all phases of sample management.

g. Laboratory analytical techniques, including EPA-approved analytical methods and quality assurance, detection levels, quality control procedures.

h. Procedures for performing a comparison of upgradient and downgradient ground water to determine whether contamination has occurred. The procedures should include:

1) A proposed method (statistical or otherwise) to compare upgradient and downdradient well water that provides a reasonable balance between the probability of falsely identifying and failing to identify contamination.

2) An accelerated sampling schedule to establish data for the comparison. In no instance shall sampling exceed __ months.

3) A proposed method for data organization and presentation.

7. By no later than __ days after EPA approval of the monitoring well network plan, Respondent shall complete the installation of the monitoring well network.

8. By no later than __ days after the installation of the monitoring well network, Respondent shall implement the sample and analysis plan, perform the comparison and submit the results to EPA for review.

9. If there is a statistically significant difference between upgradient and downgradient well water, the Respondent will develop a ground-water assessment plan capable of determining the following:

   a. The extent of migration of hazardous constituents into ground water.

   b. The concentration of each Appendix VIII constituent throughout the plume or the maximum concentration of each Appendix VIII in the plume.

   c. Background concentrations for all Appendix VIII constituents detected in ground water.

   d. Waste/leachate characteristics including specific gravity, viscosity, solubility in water, and octanol-water partition coefficient.

   e. Soil properties including cation exchange capacity, organic content, and temperature.

   The plan should describe the methods proposed to accomplish the above objectives including indirect and direct techniques. The sampling and analysis plan developed pursuant to paragraph 6 should be revised to meet the new objectives of this monitoring phase. The plan should include an expeditious schedule for the implementation of the above assessment, and should be submitted to EPA no later than 15 days after the confirmation of leakage.

10. Within __ calendar days of EPA approval of the assessment plan, the Respondent will begin to execute the plan according to the terms and schedules contained therein. Within __ days of the completion of the assessment, the Respondent will submit the results to the Agency, including all raw data collected, all calculations performed, and an interpretation of the findings.

11. Based on the results of the ground-water assessment, the Respondent will fulfill his/her obligations pursuant to §270.14(c)(7) or (8) by developing a compliance monitoring and/or corrective action program as appropriate. Respondent will submit whatever plans and engineering studies are necessary to describe the proposed program to EPA no later than ___ months after the completion of the ground-water assessment described in paragraph nine.

12. All plans, reports, and schedules required by the terms of this ORDER are, upon approval by EPA, incorporated into this ORDER. Any noncompliance with such approved studies, reports, or schedules shall be termed noncompliance with this ORDER.

13. In the event of Agency disapproval (in whole or in part) of any plan required by this ORDER, EPA shall specify any deficiencies in writing. The Respondent shall modify the plan to correct the deficiencies within ___ days from receipt of disapproval by EPA. The modified plan shall be submitted to EPA in writing for review.

    Should the Respondent take exception to all or part of EPA's disapproval, the Respondent shall submit to EPA a written statement of the grounds for the exception. Representatives of EPA and the Respondent may confer in person or by telephone in an attempt to resolve any disagreement. If agreement is reached, the resolution shall be written and signed by representatives of each party. In the event that resolution is not reached within 15 days, the Respondent shall modify the plan as required by EPA.

14. In the event that the respondent fails to:

    a. Comply with the milestones contained in paragraphs 3, 7, 8, or 10;

    b. Provide the plans and information described in paragraphs 1, 2, 4, 5, 6, 8, 9, 10, or 11;

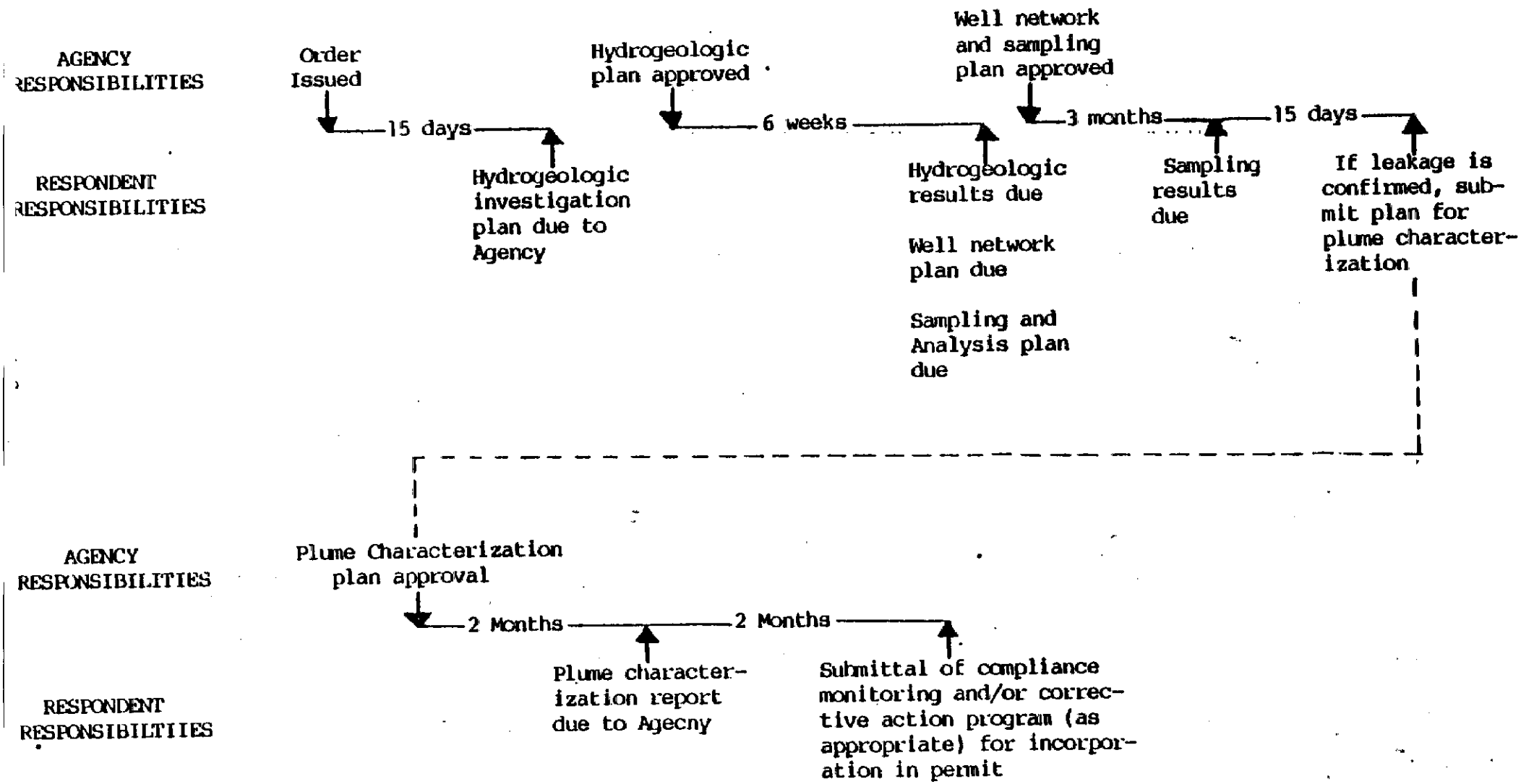
    (s)he shall pay stipulated penalties from the date of the violation as follows:

    a. $5000.00 per day for failure to comply with a milestone listed above;

    b. $1000.00 per day for failure to provide a plan or information listed above.

15. Notwithstanding compliance with the terms of this ORDER, Respondent may be required to take further actions as necessary, including additional ground-water monitoring, assessment, and/or corrective action, to come into compliance with RCRA, or other applicable state or Federal laws.

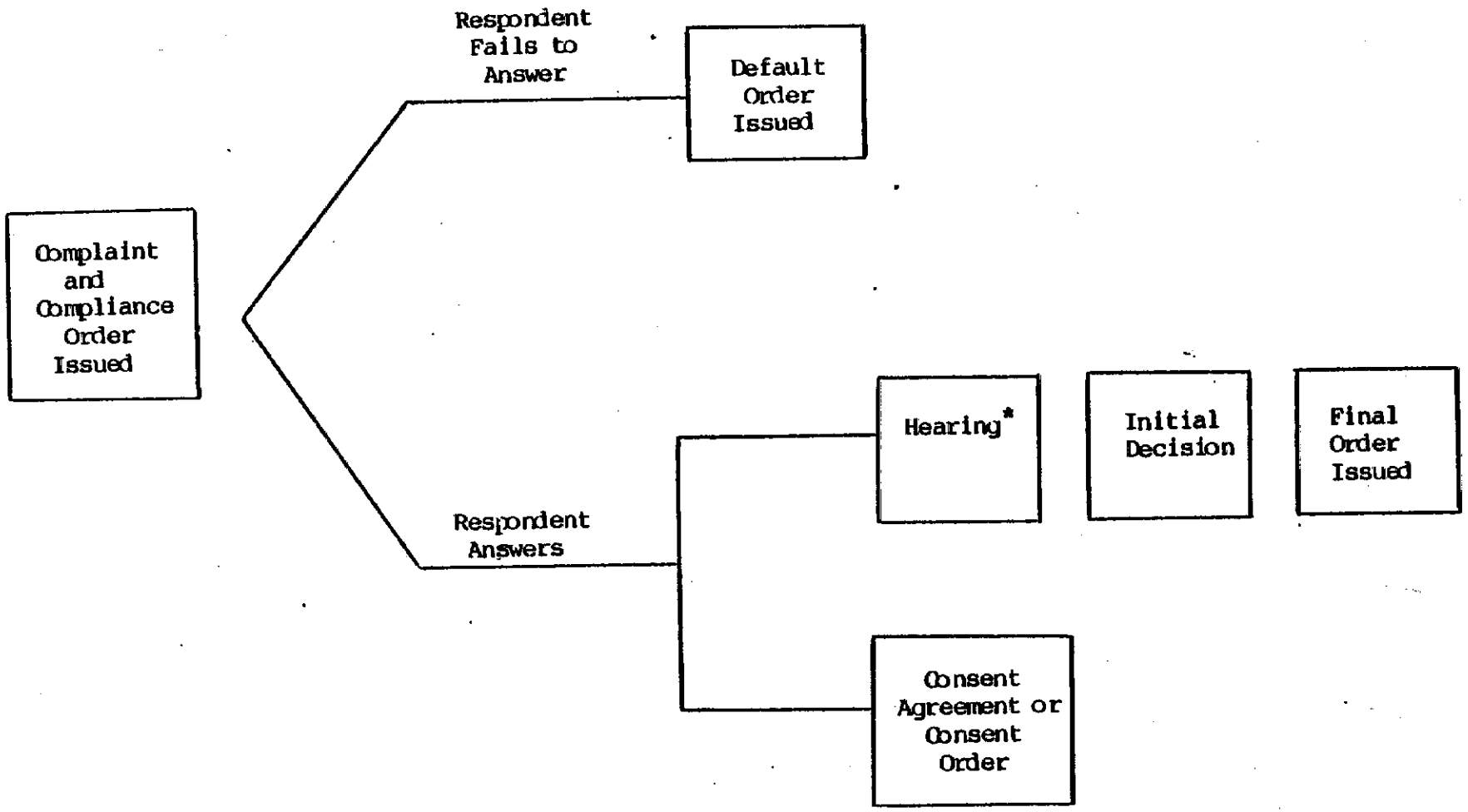
ENFORCEABLE COMPLIANCE SCHEDULE FOR MODEL ORDER



NOTE: Timef nes must be adjusted to accomodate site-specif factors

APPENDIX B:

DIAGRAM OF PART 22 ADMINISTRATIVE PROCEEDINGS



*Within 20 days after the parties are notified of the availability of the hearing transcript, any party may submit for consideration, proposed findings of fact, conclusions of law, and a proposed order, togeter with supporting briefs.